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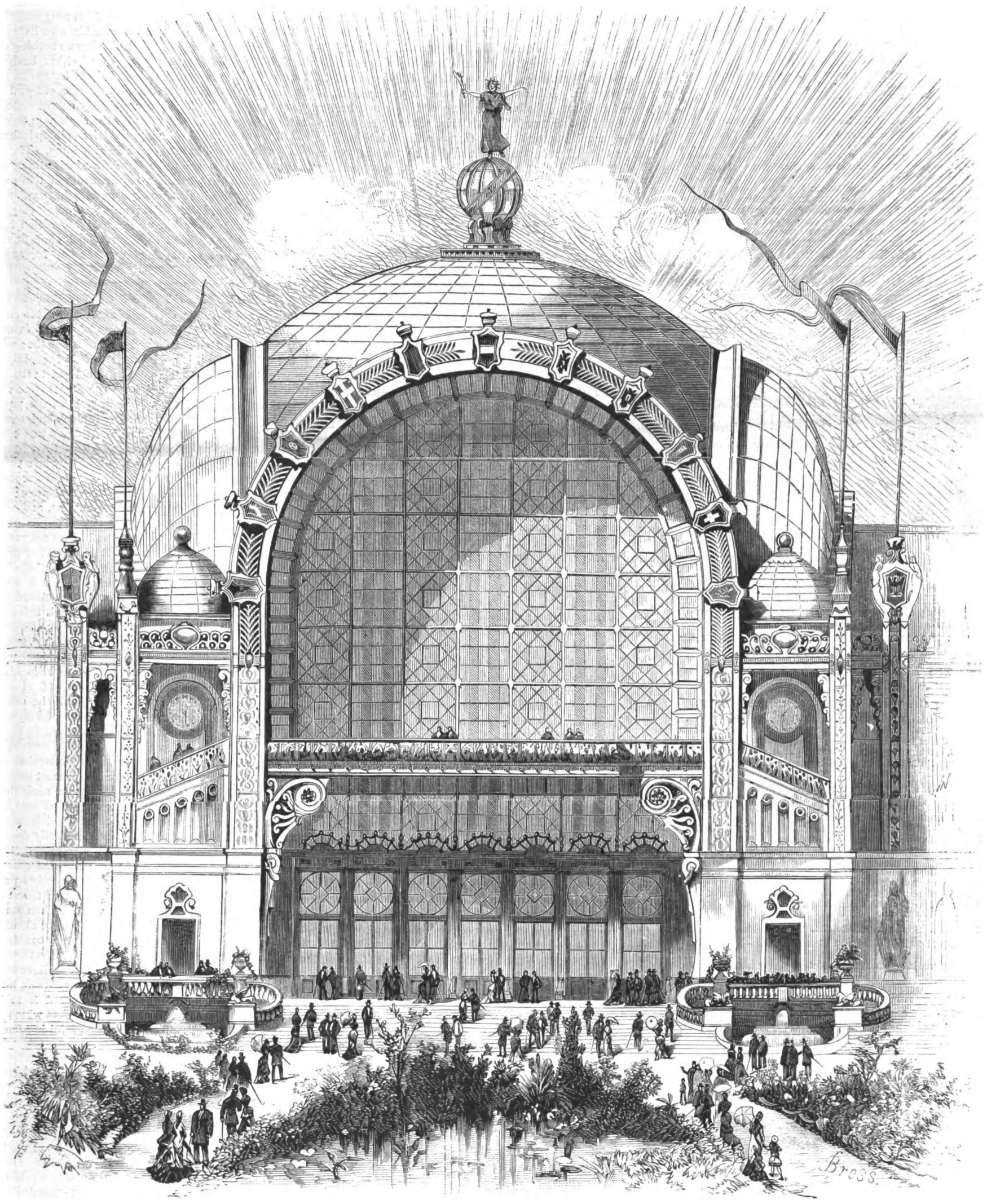

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NEW YORK, SATURDAY, JANUARY 12, 1878.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 106,
For the Week ending January 12, 1878.

Price 10 cents. To be had at this office and of all newsdealers.

THE ROAD TO SUCCESS.

What shall I do to advance myself; is a question asked by many young men when first entering upon their business career. Too many are apt to answer it by supposing that some brilliant masterstroke is the talisman that is to open the pathway of success before them. Brilliant masterstrokes, however, always carry with them great risks, and, as a rule, the advancement made by persistent effort is the safest, surest, and most easy of attainment. In choosing a profession or a trade, it is of the utmost importance to select one that is congenial to the taste; and having chosen one to stick to it, for there is a wonderful element of success in the stamina that enables men to stick. How many of our most successful men have clung to the pathway marked out, at times when fainter hearts would have abandoned the task and sought refuge in some less difficult occupation! Is this a good trade; is that a good profession; are questions that may be at all times answered by "Yes, for those with the ability necessary for their pursuit and who possess the perseverance which success at all times demands."

It is folly to expect to start out upon any career with the pathway of progress as plainly mapped out as if laid down upon a chart. For all these things regulate themselves; and while a pursuit which promises all things may prove entirely unsuccessful, one apparently very uninviting may lead to rapid progress. All occupations have their periods of activity and of dulness; the brisk business of to-day may be the dull one of to-morrow. The rapid rise of others in any particular pursuit is no criterion, because business is something like poetry, it is not so much the subject as the manner in which it is treated that determines its quality. Be especially careful not to over-estimate your own abilities. It is very natural to feel quite convinced of your personal ability, and to be aggrieved that your efforts are not more specially recognized by employers, but rest assured that in the end employers will recognize any capability you may possess at its proper value, and are at all times eager to avail themselves of any elements you may possess that are advantageous to the pursuit of their business. If, on the other hand, your ability is recognized, bear in mind that you are fairly established upon the right path, and be careful not to succumb to the inducements offered elsewhere by a slight advance of remuneration. This is, indeed, the rock upon which the hopes of thousands of young men have foundered. In a position held by dint of appreciated labor there are a great many advantages that are not visible upon the surface, and which can scarcely exist in a new position. First of all is the consideration that you are making progress, so that, be the obstacles what they may, you are surmounting them. This is a great point, because in a new position you do not know and cannot foresee what elements of opposition may exist or arise. Next bear in mind that the length of time you have been in one employ is a valuable element; you are becoming identified with the business; you are getting more familiar with it, as well as more capable of transacting your part; and above all you are making a reputation in it. You are also forming around you a number of business acquaintances who are to be useful to you for all the rest of their lives, some of whom are in the future to become employers, others prominent employees, and so on, and all of whom will be morally sure to form a tolerably accurate estimate of your stability, as well as your business capacity. How often do we hear the remark, "Oh, so-and-so rose because he had a friend who could push him ahead." As a rule, however, the disposition to advance another does not arise from friendship, but rather from a full confidence in his ability; men possessing the elements which raise them in business are usually too just, too keen-sighted, and too careful of their own reputations to risk the same by recommending others out of pure friendship. Indeed, such a course would be anything but an act of friendship, because, as compared to getting a good appointment, keeping it is ten times more difficult.

The road to success is not a royal road, but it is a tolerably straight and sure one. Anxiety and watchfulness for success, avidity to seize every promising opening, readiness to relinquish what is already gained for something apparently more inviting, is more often a by-way than the highway. The energy expended in this manner will pay a man a hundredfold more interest if directed to becoming proficient in his daily duties, in mastering the difficulties of his calling, in learning the science of his occupation, and studying its necessities. He should study not only in, but out of, working hours, when the pen, the tool, or the instrument is laid down, and his daily duties are ended. It is this which will enable future days' duties, to be performed more easily and more efficiently. In fact every jot of knowledge gained after the hours of daily labor is capital which will bear ample interest in the way of advancement; and so sure is this that, if such studies are diligently and intelligently pursued, the present will be the all-absorbing topic and the future may be left out of mind with almost perfect assurance that it will be well able to take care of itself. There are sometimes circumstances which may interrupt a successful and worthy career, but in such a case it is only necessary to begin over again, undiscouraged and with increased determination to succeed.

One of the greatest causes of failure to progress in business is a dislike to strenuous exertion, especially when manual labor is entailed. Too many young men get the idea that because they are *smart* they ought to be able to live by their wits, and they shift about from pillar to post in any occupation that does not impose what is commonly termed manual labor. This indeed is a sad mistake: desultory or itinerant occupations are laborious to the body, and from their vicissitudes and uncertainty very exhausting to the mind. All men cannot, in the very nature of things, learn or follow a trade, but those who are adapted to do so will find the pursuit less onerous and more remunerative than that of entering some other pursuit because of a dislike to manual labor. If an operative becomes a skillful workman, he is a success even though he does not attain riches; and if he permits this latter fact to make him discontented, it is not an evidence that his career has not been a success, but rather that he permits a morbid feeling on that point to overshadow his success as a workman. It seems to be a human proclivity to wish that one's occupation had been something else, almost anything indeed but that which it actually is, and we often hear it said: "If I had my life to pass over again I would be a so-and-so."

We heard it remarked a few days ago: "If my father had educated me until I was 18 years old I should not have required to toil at the bench." The reply to this was so well chosen that we give it in full as follows: "That is a mistaken idea. When a young man, of 18 or 20 years old and with a good education, sets out to earn his own living he is to be pitied. What is he fit for? He knows nothing of any man's business, he has no experience of either business or the world; he can perform clerical work, but so can the office boy who went into the office at 14 years old and had a year at a night school. He can probably do the same work as the boy, but he cannot work for the boy's pay; he cannot afford to start at the beginning, but tries to jump into a middle position which he is not capable of holding. The boy is his superior, inasmuch as he has learned something of the routine and of the particular requirements of that particular business. He is also growing up with the firm, and will in time understand the duties required in every employee's station, from the office boy up to whatever position he may himself occupy. A good common school education, with the assistance of a night school, will fit a boy for any ordinary occupation."

THE MECHANICAL THEORY OF FORGETFULNESS.

It is one of the most curious phenomena of the memory that knowledge acquired for purposes of special future use may be remembered clearly and well up to the time when it is used; but when it is no longer required it rapidly fades away. Actors, for example, who are obliged to study new parts frequently, and commit long speeches to memory in very short periods of time, apparently have the power of cleansing the memory and rendering it blank and receptive to new tasks. Nor does the number of times a part has been played successively seem to affect this capability, for actors have informed us that, after even taking part in a performance which has been repeated night after night for months, the reproduction of the same play, after the lapse of a year or so, finds them almost ignorant of the text, and necessitates complete re-study. The same is true of pupils in school, and there are doubtless few teachers who have not remarked the dismay which a sudden turning back to review previous tasks excites among a class of apparently bright scholars, or who has not discovered that a perfect recitation is no proof that the substance of the knowledge will be found in the pupil's memory a week afterwards. Although this capability of freeing the mind is rather a drawback to education, it is of inestimable value in the affairs of daily life. It enables the business man to throw off the cares of the office when he crosses its threshold at night, the lawyer to keep his mind clear of the discords of his clients and to avoid continuing the anxieties of one case into the details of the other, the physician to keep separate the ailments and idiosyncracies of his patients; and thus its application might be traced in every profession and calling.

It has become so much the custom to seek mechanical explanations for circumstances apparently the most unmechanical that it is almost to be expected that, in analyzing this peculiarity of the mind, psychologists will at least borrow mechanical terms. This Mr. Verdon, in his elaborate essay on forgetfulness, published in *Mind*, manifestly does when he regards memory as energy, and absence of forgetfulness a conservation of the same. He points out that practically we sometimes keep a matter in mind, not exactly by attending to it, but by keeping our attention referred to something connected with it from time to time. Now when the use of the record is withdrawn and we think no more about it, we experience a feeling of relief, and we thus may conclude that energy is in some way liberated. After this the record does not seem conserved so well as before, and we have real difficulty in attempting to remember it. It is not rash, he adds, to suppose that this degradation of the record is real, that the record is left to decay, and that the forces which would have tended to preserve it now become useful in some other way.

Mr. Verdon supposes the existence of a "versatile energy," which is locked up in the memory, but which, after it is used to get up facts of one kind, may be employed to acquire facts of another kind, provided the former become reduced to the level of the general stock of the individual's knowledge. A actor, for example, learns a part, plays it, forgets it, and thus liberates versatile energy, which enables him to acquire another, and so on; but on the other hand, if the same person really assimilates knowledge so that it requires no attention to keep it from rapid decay (as in learning to read and write), there is little chance of forgetfulness liberating energy of use for further acquisition. The deduction from this, evidently, is that a person may exhaust his stock of

versatile energy upon a few things, and eventually become incapable of learning others. Probably this accounts for the difficulty which every person late in life encounters in acquiring knowledge which children easily learn.

A good memory is therefore not an unmixed blessing, but, on the contrary, forgetfulness is often to be desired. One may steep his mind in the waters of Lethe, according to one author, by fixing his mind on that part of any experience which has the least permanent interest. The temporary is thus remembered at the expense of the more permanent, and thereafter the latter is forgotten, while the temporary drops out from its own inherent want of interest.

THE PATENT MIDDLINGS PURIFIER CASE.—ANOTHER IMPORTANT DECISION BY THE SUPREME COURT.

A case of considerable importance to the milling fraternity has recently been decided in the Supreme Court of the United States, under the following circumstances:

A suit was brought by the owners of the Cochrane patents against Deener and others, about two years ago, in the District of Columbia, as a test suit under said Cochrane patents, which, after being ably argued, was decided in favor of the defendants. The plaintiffs appealed to the Supreme Court, and the case was heard in the October term of 1876, when the decision of the court below was reversed, and a decree given in favor of the Cochrane patents.

Shortly after that decree was entered a suit was commenced in the Circuit Court for the District of Minnesota against Christian *et al.*, in which the bill of complaint set forth that the validity of the Cochrane patents became *res adjudicata*, by the decision of the Supreme Court. An injunction was granted against the owners of mill, but it was afterwards suspended on the giving of a bond for $250,000.

Other suits were then commenced in the eastern district of Missouri, under the same patent, in which suits a special injunction was asked for. Just before the hearing in that case a letter came to light purporting to come from one of the counsel of the appellees in the case of Cochrane *vs.* Deener, setting forth that the appellees had no substantial interest in the case at the time it was heard, that one of their counsel had written his argument on one point only, that his fees had been very meagre, and that hence he had not discussed any of the other points before the court. Thereupon Mr. Harding, of Philadelphia, on behalf of some of the opponents of the Cochrane patents, made a motion before the Supreme Court to vacate the decree formerly made by that court in favor of those patents, on the ground of collusion between the parties. In consequence of which the court ordered an investigation to be made before a master, which showed that, just before the argument of the case in the Supreme Court, an agreement was entered into between the owners of the Cochrane patents and the defendants in that suit, that if the defendants were defeated they would only be required to pay on each of the two mills used by the defendants (twenty-three run of stone altogether) $250 cash and $250 in a note running for a year, for a full release for all past claims, and that each mill was, without any further consideration, to have a perpetual free licence. This, it was argued by the counsel opposing the Cochrane patents, showed collusion between the parties to the suit, especially when it was considered that the owners of the patents had sued a single mill in Minnesota for $300,000 damages, and hence the decree should be vacated.

In addition to this agreement between the parties, it was shown that the appellees would only pay such small fees to their counsel—about one third what they wanted—that it was likely their efforts corresponded with their pay, and that if better fees had been paid, better argument would perhaps have been made.

The counsel for the Cochrane patents in answer denied the collusion, stating that all the parties to the suit were interested in having the case thoroughly tried; that the suit was instituted as a test case, its principal object being to obtain a decision of the Supreme Court on the validity of the Cochrane patent, upon which, if favorable, it was intended to rely, in asserting their rights against all infringers; that their object in fixing the sum of $1,000 as the amount which they would claim for the past and future use of defendant's machinery if they obtained a reversal of the decree, was solely to expedite matters and prevent any vexatious or unnecessary delays; and that knowing that such decision would be of no value unless made upon a full exhibition of the case, they by suggestion contributed to the introduction into the case of all the defense which they had knowledge of, in order that they might be disposed of in the final decision.

After the arguing of the case the Supreme Court, through Judge Bradley, delivered the following as its opinion:

"After a careful examination of the evidence adduced on the motion to vacate the decree in this case, we see no ground to believe that the appellants are chargeable with any collusion with the appellees in reference to the argument of the appeal. On the contrary, the weight of the evidence is that they repelled any arrangement or proposition which might look to that end. Whilst we would not hesitate to set aside a decree collusively obtained, the proof ought to be very clear to induce us to do this at the instance of strangers to the suit, though incidentally affected by the decision of the questions involved.

"At the same time as the decision in this case is made the basis for applications for injunctions against third parties in the Circuit Courts, it is right that we should say that, in the argument of the appeal before us, the case on the part of the appellees was, as it seemed to us, very imperfectly presented; and the evidence laid before us on this motion demonstrates the fact that the appellees, in consequence of the conditional arrangement with the appellants, which they secured before the argument was had or from some other cause, omitted to prosecute their defense with that degree of zeal and efficiency which the importance of the case would otherwise have demanded. The result was that the labor of the court, and its liability to overlook points of weight and importance, were greatly increased. As the case was presented to us, we see no cause for changing our views. But under the circumstances we think that third parties, who had no opportunity of being heard, and whose interests as opposed to the Cochrane patents are very important, should not be precluded from having a further hearing upon it whenever a future case may be presented for our consideration.

"The motion is denied with costs."

This decision although against the vacating of the decree, will it is thought have the effect desired by the maker of the motion to vacate it, as it throws strong doubt upon the character of the argument presented on the part of the appellees in the former decision, and will probably prevent its being used as a basis for injunctions or bonds in the circuit courts throughout the country. This will be likely ot result in a new test case, brought on under the care of the best obtainable counsel, in which the question as the validity of the Cochrane patents will be thoroughly answered.

CHLOROFORM.

Dr. Julian J. Chisholm, Professor of Eye and Ear Diseases in the University of Maryland, has lately published a pamphlet entitled, "What Anæsthetic Shall We Use?" wherein he takes strong ground in favor of chloroform, and deprecates the disfavor into which that drug seems to have fallen on account of the deaths which have occurred among patients under its influence. The drift of his views is that chloroform accidents are preventible, that deaths occurring, or rather attributed to the drug, are too often due to the shortcomings of those who administer it, and to its administration under improper conditions, when it should not have been given.

One of the most common causes of death is due to the operator failing to push the inhalation to the degree of suspending the functions of such parts of the cerebro-spinal system as preside over the emotional, sensational, motor, and reflex acts; or, in other words, the condition in which peripheral irritation can no longer be transmitted through the cord to the brain, and then back, by the vagus and pneumogastric nerves, to the cardiac ganglia. Any condition short of this stage leaves the heart exposed to those serious inroads from peripheral irritation through which its movements may be suddenly and permanently arrested. In this way can be satisfactorily classified the many deaths under anæsthetics for trivial operations, such as tooth drawing, abscess opening, etc., when only enough of the agent was inhaled in the sitting posture partially to stupefy, but not to protect against reflex accidents from emotional or peripheral excitement. When deaths occur under these circumstances the fatal result is not to be attributed to the anæsthetic, but to the want of it. Another cause of death is over-administration. Chloroform has a toxic action, while besides its dose can be made large enough to kill by enfeebling and finally paralyzing the nerve centers from which the heart and lungs draw their inspiration.

That which Dr. Chisholm calls "the only legitimate of all causes of death from anæsthetics," is that unknown condition called idiosyncracy, in which anæsthetics show themselves poisons of extreme fatality. The patients who carry about with them this innate fatality exhibit it by no recognized signs. When they die from toxic inhalation the autopsy reveals absolutely nothing to indicate the destructive effects of the poison.

Dr. Chisholm adduces a large amount of statistical information to show the infrequency of deaths under chloroform treatment, and shows an array of over 250,000 administrations of chloroform with but 12 deaths, thus affording strong proof of the rarity of the fatal idiosyncracy.

THE TROUVE MULTIPLE TELEPHONE.

M. Trouvé, the well known French electrician, has lately submitted to the French Academy of Sciences, an account of experiments conducted by him upon the Bell telephone, the object being to increase the capabilities of that apparatus and to render it available over any distance, however long. Instead of the single vibrating diaphragm used by Professor Bell, M. Trouvé substitutes a cubical chamber, each face of which (with one exception) is a vibrating membrane. Each of these membranes, being thrown into vibration by the same sound, influences a fixed magnet and electric circuit, the same as in the Bell arrangement. By associating all these currents, a combined current of single intensity proportional to the number of magnets influenced is produced. Instead of the cube, a polyhedron having an indefinite number of vibrating membranes may be used, and thus intensity augmented as desired.

Suppose now a line established on which is disposed a telephone constructed as above described, the membranes and magnets of which are divided into two series, and the circuits so arranged that, by pronouncing a word, currents are produced on the same wire in opposite directions. When a despatch is received to be transmitted further on, the operator talks in the telephone in the usual way; and his speech, by the arrangement of circuits above noted, is heard both at the station to which he is forwarding the message and also at the one from which the message was sent, so that the possibility of error is thus rendered nil. M. Trouvé has adapted this apparatus to his military telegraph.

NOTES OF PATENT DECISIONS.

PATENT OFFICE DECISIONS.

The Commissioner of Patents has decided the interlocutory appeal from the decision of the Principal Examiner in the matter of the application of Temple for letters patent, adversely to the applicant.

The original application was for a process invention. It admitted of illustration by drawing, but no drawing or model was submitted. Subsequently the applicant sought to amend his original application, a drawing being filed and a description inserted relative thereto In the proposed amended specification many elements, which appeared to be essential parts of the invention, were included in the claim. These elements, however, were omitted from the original specification. The case, therefore, came up under Rule 32 of Office Practice, which provides as follows· "All amendments of the model; drawings, or specification, in the case of original applications which are capable of illustration by drawing or model; must conform to at least one of them as they were at the time of the filing of the application; further changes than this can only be made by filing a new application. If the invention does not admit of illustration by drawings amendment of the specification may be made upon proof satisfactory to the Commissioner that the proposed amendment is a part of the original invention."

The Commissioner decides that Temple is not entitled to the proposed amendment. Such amendment he considers "new matter" as it conforms to no part of the case as it existed at the time of its filing. The concluding provision of Rule 32, which permits the admission of an amendment on satisfactory proof that it is part of the original invention, cannot apply to the case under consideration, because in this case the matter is capable of illustration by drawing and model. The object of this prohibition in Rule 32, against the introduction of "new matter," is to limit the power of amendment, so that it is possible to determine when an application is completed.

COURT DECISIONS.

The Supreme Court of the United States, in deciding the appeal in the infringement suit of Romer vs. Simon, lays down the following rules of law:

Where the patent described in the bill of complaint is introduced in evidence, the patentees are presumed to be the original and first inventors of the described improvement; and when they have proved the alleged infringement, the burden of proof is cast upon the defendant to show that the patent is invalid unless the patent is materially defective in form.

Proof of prior use of the alleged invention, in a foreign country, will not supersede a patent granted here, unless the alleged invention was patented in some foreign country. Proof of such foreign manufacture and use, if known to the applicant for a patent, may be evidence tending to show that he is not the inventor of the alleged new improvement, but it is not sufficient to supersede the patent if he did not borrow his supposed invention from that source, unless the foreign inventor obtained a patent for his improvement, or the same was described in some printed publication.

TO OUR SUBSCRIBERS.

In accordance with our usual custom, at the beginning of this new year we turned over a new leaf in our subscription book, placing thereon only the names of those whose subscriptions have been renewed, or that have not expired.

All whose papers have ceased to come may know that their subscriptions have expired; and we hope they will be prompt in sending the money, $3.20, for renewal for one year, or $1.60 for six months. We will supply the back numbers, commencing with the year.

Influence of Organisms on Eggs.

MM. Bechamp and Eustache have determined that eggs may remain for long periods in a medium filled with infusoria, without the latter traversing the shell and penetrating the interior. The shell, however, allows the passage of microscopic mucedinæ, which make their way through the lining membrane and develop very abundantly on its internal face. The membrane surrounding the yolk presents, however, an insurmountable barrier to their further progress, but should their entrance into the yolk be effected an alteration takes place, which is a true fermentation and distinct from putrefaction.

Amyloid Degeneration of the Cornea.

By introducing liquids impregnated with spores into the cornea of rabbits, Dr. A. Frisch has found that the corpuscles of the cornea undergo a metamorphosis of their protoplasm into shapeless brilliant masses. The sheath of the conjunctive tissues of nervous fiber, with or without marrow, remains intact, but becomes filled with flattened masses having an intense refracting power. These and other substances show amyloid reaction on contact with iodine and sulphuric acid, and resist the action of digesting liquid. Examined under polarized light, all the portions affected with amyloid degeneration become bi-refracting.

A Steam Sled for the North Pole.

At a recent meeting of the London Association of Foremen Engineers and Draughtsmen, Mr. Daniel Cartmel, late Chief Engineer of H.M.S. Discovery, and now of H.M.S. Cleopatra, read a paper on "Polar Exploration, with Suggestions for the Employment of Steam Power in Effecting it." The author, with the aid of several charts and diagrams, explained, in the first instance, the geographical and meteorological characteristics of the arctic regions, and then advanced to his subject proper. Mr. Cartmel, from his experiences during the expedition of Captain Nares, came to the decided conclusion that sledging by manual power was a hopeless method of attempting to reach the North Pole, and since his return has been busily engaged in devising a steam sledge for that purpose. This contrivance, as described by the inventor, consists in its general outlines of a flat-bottomed boat with two stern wheels, the midship cross section being a parallelogram. It would be constructed of steel plates lined with wood, perfectly rigid, and capable of standing the roughest usage. The boat-sledge, as it may be termed, would be highly polished so as to minimize friction, whilst the bow would be stayed and strengthened to the fullest extent, so as to resist concussions. Of course the steam power is intended to be concentrated as much as possible, whilst the steering wheels would be driven directly from the crank shaft. The proceedings closed with a vote of thanks to Mr. Cartmel, who also explained that the sledge might be warped forward with rope, and capstan, when desirable. Here is a suggestion for Captain Howgate and other members of the American Arctic Colony, now trying to reach the North Pole.

Utilizing Subterranean Heat.

The Virginia City (Nev.) *Enterprise* says: "An enterprising engineer of this city is engaged in working out a plan for heating the whole town by means of the heat generated in the subterranean regions of the mines. He says there is sufficient heat in the lower levels of the mines underneath our feet to comfortably warm every house and every room in the city, provided it can be utilized. His plan contemplates a system of pipes, through which the heat will be distributed, while at the same time it will be drawn out of the mines as it arises. Thus he will at the same time heat the town and ventilate the mines."

Pneumatic Postal Despatch, Berlin.

The proposed pneumatic despatch system in Berlin will comprise 26 kilometers of tubing and fifteen stations. The bore of the tubes will be 65 millimeters. They will be of wrought iron and will lie about a meter below the surface of the ground. The letters and cards which are to be forwarded have a prescribed size, and are enclosed in iron boxes or carriers each of which can hold twenty. From ten to fifteen carriers are packed and forwarded at a time, and behind the last is placed a box with a leather ruffle, in order to secure the best possible closure of the tube. The exhausting machines and apparatus required for the transmission are situated at four of the stations. Both compressed and rarified air, or a combination of the two, are employed in propelling the carriers. Steam engines of about 12 horse power are used in condensing or rarifying the air. Each of the four main stations has two engines, which drive a compressing and exhausting apparatus. Large reservoirs are used for the condensed and rarified air. The tension of the condensed air is about three atmospheres, and that of the rarified about 35 millimeters of mercury. The condensed air, heated to 45° C. by the compression, is cooled in the reservoirs which are surrounded with water. The velocity of the carriers averages 1,000 meters per minute, and a train is despatched every 15 minutes. Each of the two circuits, into which the system is divided, is traversed in 20 minutes, including stoppages. The entire cost of the enterprise is estimated to cost 1,250,000 marks.

THE NEW YORK ELEVATED RAILWAY.

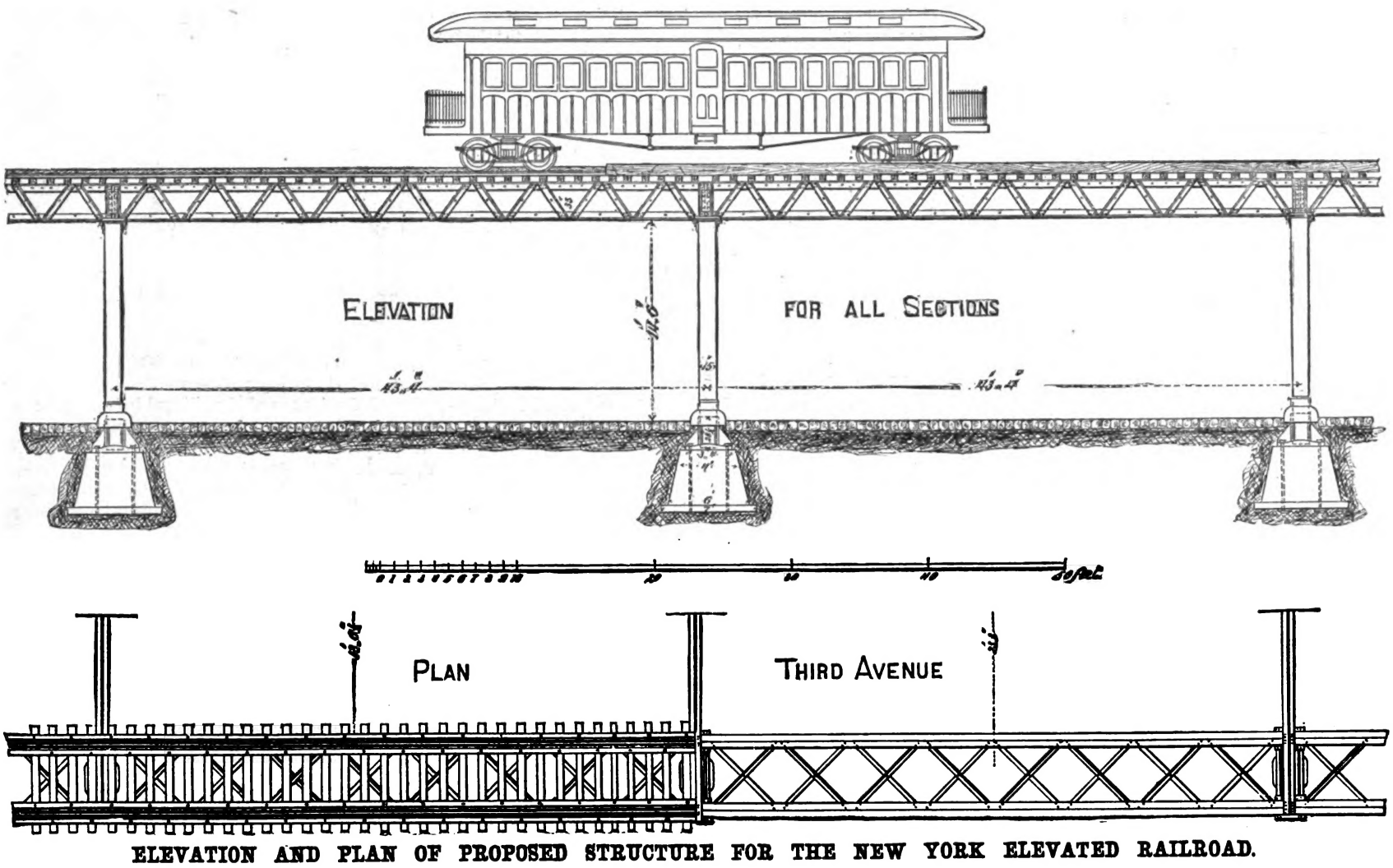
Along Sixth, Ninth, and Third avenues, Pearl street, West Broadway, and other great thoroughfares of this city, large gangs of men are at work, digging foundations and erecting the structures which form the roadway of the different elevated railroads. Within a very few months trains will be running over these new aerial routes, and the long vexed problem of rapid transit, which has been discussed in this metropolis for nearly a quarter of a century, will at length be solved. Whether this solution will have been accomplished in the best possible manner and in conformity with the rights and convenience, both of the traveling public and of the public whose property is affected by the proximity of the necessary structures, is open to question. We have reviewed in these columns all the schemes having a like result in view, and have advised in favor of the underground plan, pointing out its entire feasibility, and directing attention to its successful operation in London, in this city, and elsewhere. In rather anomalous manner, however, the Legislature has authorized the Gilbert and New York Elevated railways to carry their tracks above the same routes, the franchises of which had previously been bestowed upon the street car corporations. Our lawmakers have set aside the old law maxim that right in real property is supposed to extend upward to the heavens; and the highest court of judicature in this State has affirmed the legality of the privileges accorded to the elevated companies, and of the means whereby the latter propose to carry out their projects.

It remains, therefore, but to examine into the practical features of the now adopted plans. Their disadvantages affect, first the horse car companies, whose tracks are virtually inclosed in a tunnel; second, the property owners along the route, before whose second floor windows trains constantly thunder, and whose buildings along the line are depreciated in value without any means of reimbursement or compensation being open to them; and. lastly, the general public, through the obstruction produced by such large structures in important thoroughfares. Their advantages enure to whoever travels upon them, for certainly no more pleasant mode of locomotion can be suggested than to be rapidly whisked along in roomy, well warmed or ventilated vehicles, high above the dust and noise of the crowded streets.

In this article—which is the first of a series on the means of rapid transit in New York, to appear from time to time in these columns—we present a detailed description of the New York Elevated Railway, a portion of which is now in operation over a length of about 5 miles, extending from the southern extremity of the city at the Battery to 61st street, on the north, near Central Park. A perspective view of this road is given in Fig. 1; and in the annexed drawings, for which we are indebted to the *Railroad Gazette*, the details of construction, as the same differs at various portions of the route, are shown. Except over about one third of its length this road is now single track.

The work in progress involves the completion of the second track between the Battery and 61st street; a double track extension along Ninth avenue from 61st street to 81st street, west side; double track road from Whitehall street through Front and Pearl streets, the Bowery and Third avenue to 59th street, including branches to the ferries, western terminus of the East River Bridge and the Grand Central Depot, east side, comprising altogether about three miles of single and six miles of double track.

From the map given herewith (see page 20) this route can be followed in heavy black lines. The route of the Gilbert railway is marked in dotted lines. We shall devote a separate article to the Gilbert system, which differs in many respects from that under consideration. The New York Elevated Railway has a structure based on the "one-legged plan," the essential feature of which is that the weight of roadway as far as possible is carried immediately over the posts which support the structure. The Gilbert Company, on the contrary, in nearly all cases, supports its roadway between the posts on transverse. It will be seen, however, from the drawings, that the elevated road adopts this latter mode, over its Whitehall street route. As the drawings are all marked with the names of the streets, the reader can easily trace for himself the various modifications of structure which have been adopted to suit varying localities. Front and Pearl streets from Whitehall street to Franklin Square being narrow, with but little room in the roadway, the latter is either spanned or a single track is carried by each line of columns over the curbs. The latter plan is preferred.



ELEVATION AND PLAN OF PROPOSED STRUCTURE FOR THE NEW YORK ELEVATED RAILROAD.

From Franklin square to the intersection of the Bowery with Third avenue, along the New and Old Bowery, owing to the number of surface railroad tracks and other circumstances, the columns must be on the line of the curbs.

On Third avenue the upper stories of the buildings are occupied very generally as dwellings, and it was thought desirable to remove the tracks as far from the houses as possible, and as the roadways are 50 feet wide, with a double line of surface horse railroad tracks in the middle, a line of columns is to be placed upon each side of the horse railroad tracks, and connected at the top by light elliptic arch girders. The track superstructure will be 17 feet or over above the grade of the surface railroads, and the columns in the roadway 15 inches square. and in nearly all cases 15x18 inches when on the curb. The general average length of the spans will be 48 feet 4 inches. the girders made of open lattice work, and 88 inches deep, and to be proportioned so that no part of them will be subjected to a greater strain of tension and compression than 8,000 lbs. per square inch, or a greater shearing strain than 6,000 lbs., and the maximum deflection of the girders when loaded not to exceed one fifteen-hundredth of its span. The columns will consist of two 15 inch rolled channel beams united by lateral bracing, consisting of 8½x⅝ inch bars riveted to the flanges of the beams. Where the track is carried over the columns, the tops of the channel beams are curved outward from the center each way far

enough to support the longitudinal girders. When the track is carried on girders between the columns, the channel beams of the post are carried up straight. The lower ends of the beams will be set into sockets of cast iron bed plates weighing about 2,200 lbs. each. The bed plates will be 3 feet 4 inches square at the base and secured to masonry foundations by four anchor bolts 2 inches in diameter. The foundations will generally be about seven feet deep and seven feet square at the bottom; and are to consist of flag stones and hard burned bricks laid in hydraulic cement mortar.

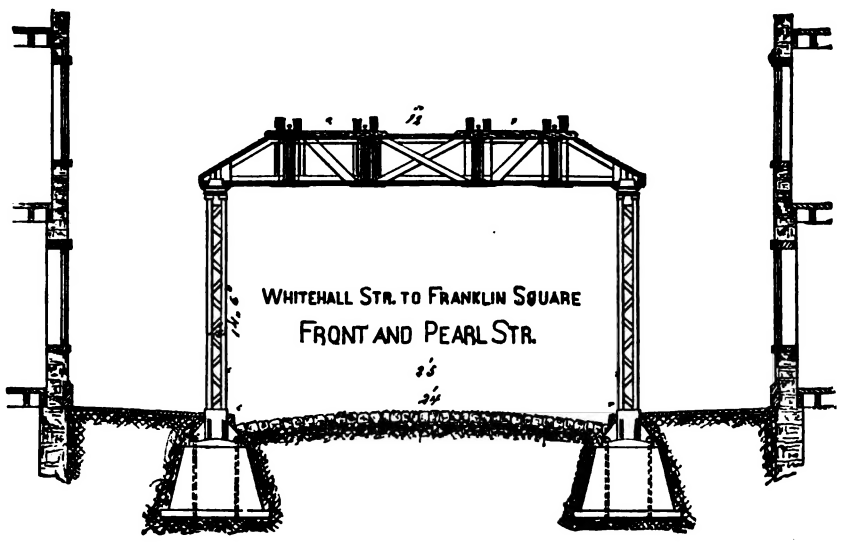
The top chord of the longitudinal girders will be composed of two 6×6×$\frac{9}{16}$ inch angle bars, and the lower chords of two 5×5×$\frac{9}{16}$ inch angle bars, riveted together so that each will form a T, the two riveted by double angle braces, 5×3×$\frac{7}{16}$ inch at the ends of the beams and 4×3×$\frac{7}{16}$ inch in the center, placed back to back on the outside of and embracing the Ts by being properly riveted together.

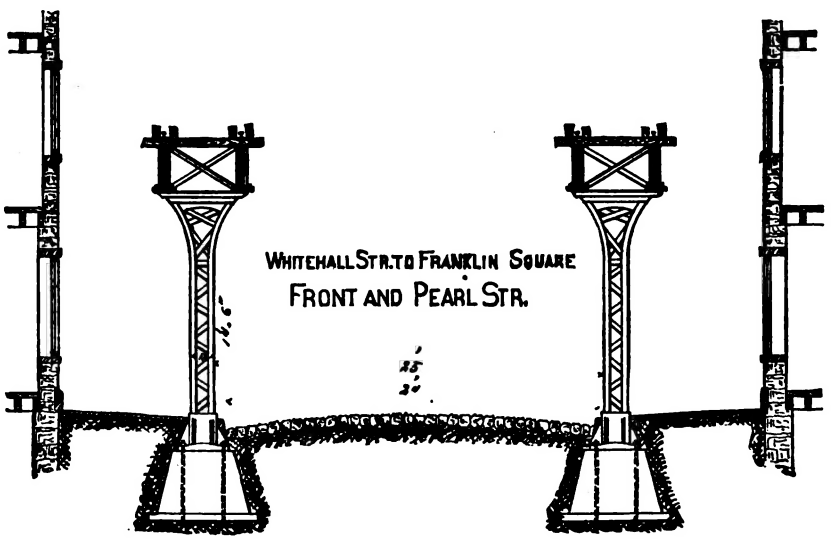
The track will be of 4 ft. 8½ in. gauge, the superstructure consisting of Bessemer steel rails, weighing fifty pounds to a yard and laid on yellow pine cross ties 7 ft. long by 6 in. by 5 in., to be placed ten inches apart in the clear. On each side of each rail longitudinal guard timbers are to be placed. the inner ones are to be 5 x 8 in. and the outer ones 5 x 10, the ends to be securely spliced together, and each guard will be bolted to every alternate tie, and each tie bolted by two bolts to the guards. The cross ties will be secured to the longitudinal girders by lag screws with washers at the bottom, the latter projecting under the top flanges of the girders, clamping the ties to them.

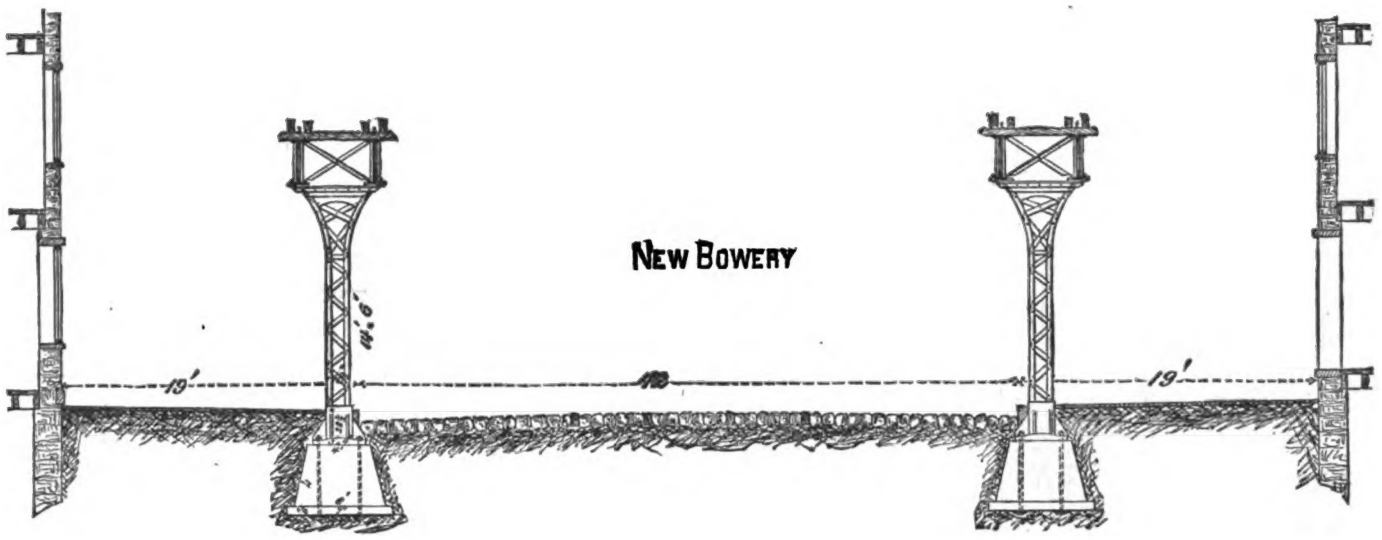
The rolling stock at present used on the Greenwich street road consists of light four-wheeled engines, of the form shown in the perspective view, Fig. 1. These weigh from 12,000 to 14,485 lbs. with a full supply of coal and water. The driving wheels are 33 in. in diameter, placed five feet apart. It is proposed to increase the weight of the engines to 16,000 lbs.

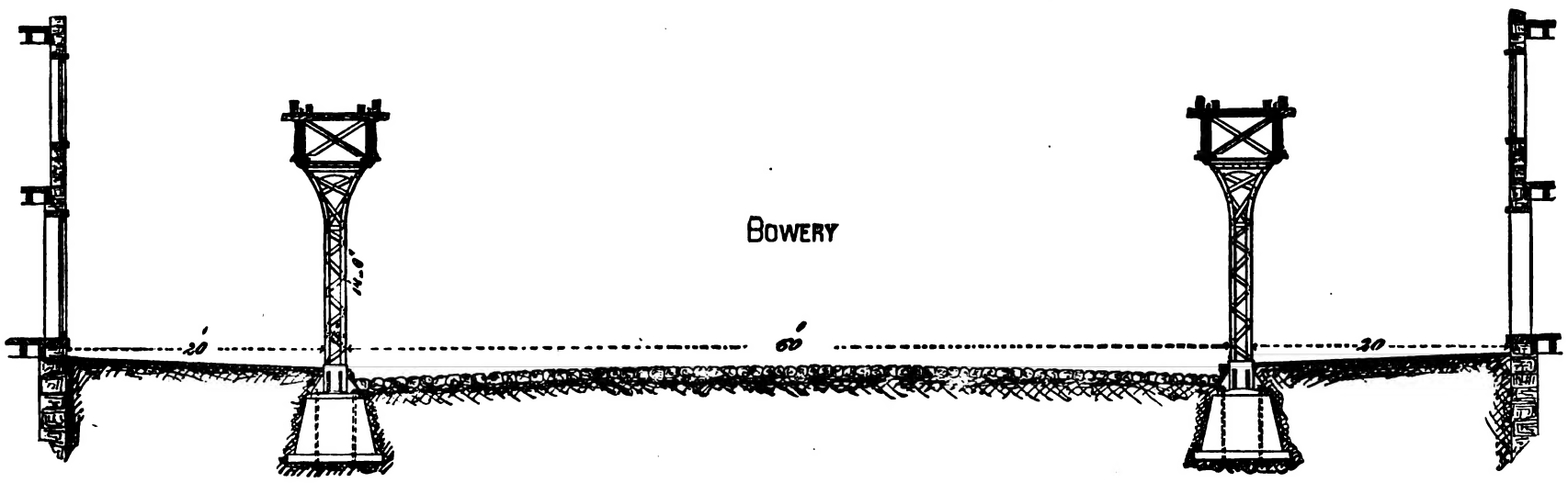
The last passenger cars purchased weigh, when empty, about 16,000 lbs., and are 41 ft. 6 in. long over the platforms; the bodies are 35 ft. 6 in. long by 7 ft. wide, and seat 48 passengers. It is thought that the cars can be made lighter.

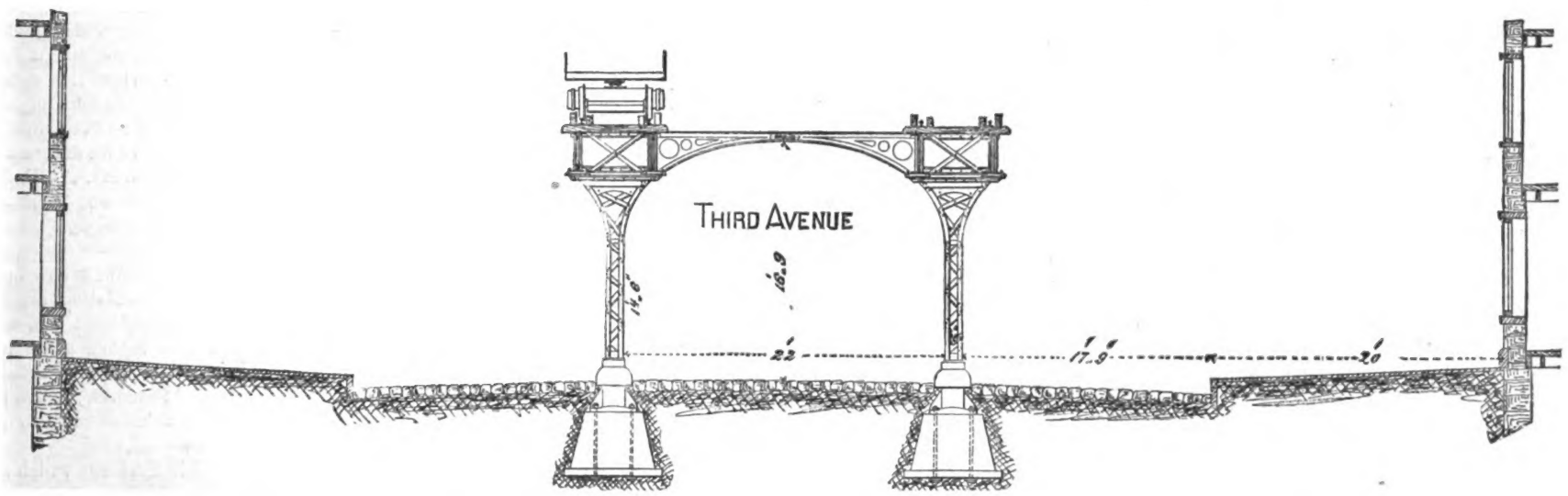
At first sight the impression produced by the appearance of the one-legged structure, as it has derisively been called, is that it is lacking in lateral stability. This, however, is not the case, as the structure is subjected to very little lateral strain, the chief difficulty being to give sufficient longitudinal stability to resist the action of the momentum of the train when the brakes are applied. This difficulty arises from the necessity of allowing space between the ends of the girders for their expansion and contraction, and therefore such strains cannot be transmitted through them to more than two, or probably three, columns. To provide for this,









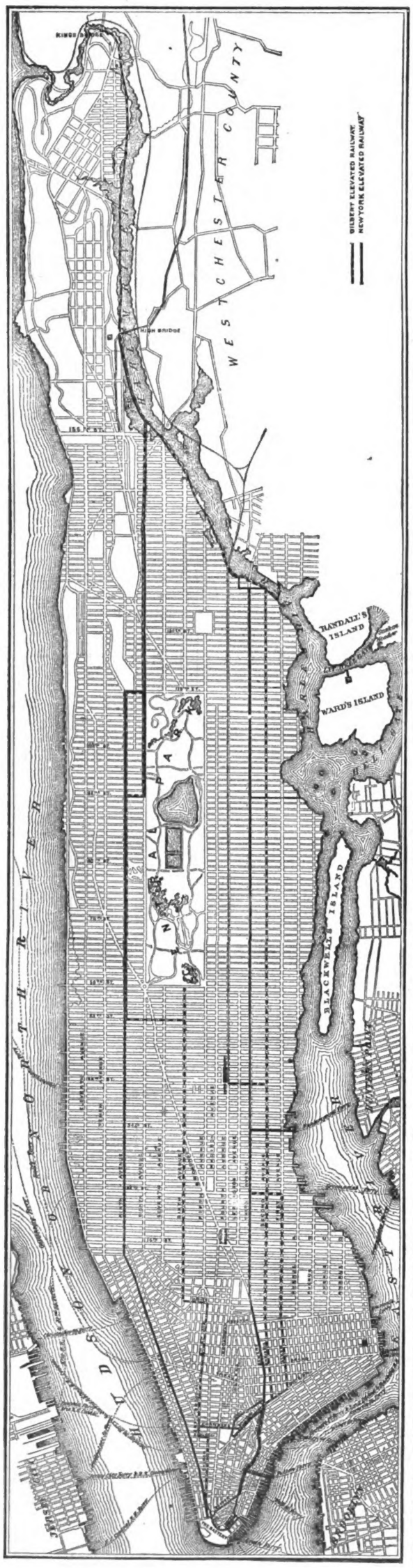


TRANSVERSE SECTIONS OF PROPOSED STRUCTURE FOR THE NEW YORK ELEVATED RAILROAD.

the longitudinal guard timbers, which are not subject to expansion by changes of temperature, are securely bolted through the cross ties and to the flanges of the top chord of the girders. In this way the longitudinal strains are distributed over an indefinite length of the structure.

MINERAL WOOL.

A small portion of the waste product of a blast furnace may be successfully utilized by converting it, while in the molten state, into the materal known as mineral wool. The cheapness of the slag and the simplicity of the process render the manufacture of mineral wool capable of being carried on in all iron districts, and it is the object of this article to give such an explanation of its properties and characteristics as may be of general interest.



MAP SHOWING LOCATION OF RAPID TRANSIT RAILROAD IN NEW YORK.

The New York Elevated Railroad is represented by black lines; the Gilbert Elevated Railroad by dotted lines.

The process is confined to the treatment of substances containing a high percentage of silica. Regarding slag as a silicate of lime and magnesia and alumina, we can readily see that, as the silica acts as the acid, its presence in a low or high degree gives wide range for difference in the resulting slags: and according to the predominance of either base or acid, they are classed as basic, acid or neutral. A great variety of mineral wools is thus afforded, but experience has shown that a neutral slag produces finer fibers than one containing a large amount of silica, and therefore it is more pliable and easier of application. Slags containing manganese make a greenish wool, while pink or reddish wool appears to accompany hard grades of iron. Under other circumstances the wool will be white, being purest white when the percentage of base is large and assuming a gray and smoky color as the silica increases.

The diagram shows a section of the mineral wool house and apparatus at the Clove Furnace, Greenwood Iron Works, Orange County, N. Y. At this furnace, as at the majority of American furnaces, there is not sufficient room about the stack to erect a chamber in which to blow the mineral wool, and even if there was ample space it would be economy to allow the slag first to run into box-cars and afterward tap these, because the cinder, when it comes directly from the furnace, flows too fast to be controlled and properly utilized. As a result of this difficulty the wool-house stands about 100 feet from the furnace. When a car is run full of fluid cinder it is taken in front of the wool-house, the chilled slag knocked out of the tap-hole, and a small stream only allowed to fall to the runner, over which it travels and again falls 3½ inches, where it is met by the jet of steam.

The sudden impact of steam or air under pressure against thinly flowing slag immediately scatters the stream, forming a spray of small globules or shot, which, on becoming detached from the larger mass, stick, as it were, and thus give a beginning to the vitreous thread.

The aperture of the nozzle which forms the jet of steam plays a most important part in separating the stream of slag into small shot at the outset, for it is obvious that the smaller they are at the first the greater the possibility of their being absorbed in the fiber, which is pulled out in their flight. The blowing part of the process has been so far improved that the shot are much less than a sixteenth of an inch in diameter, and there is no need of separating them from the wool, as they do not impair its effect.

The wool house is 30 feet long by 14 wide; the gable of the roof is 21 feet above the floor, and a sheet iron extension 10 feet long reaches to the slag car. The frame of the building is covered on the interior with thin sheet iron. The front of the house is provided with a window which serves as an outlet for the currents created by the jet of steam, and these currents carry a portion of the lightest wool up on the top floor. The mineral wool taken from the first floor is entirely free from shot, and is called No. 3; the other two grades are deposited on the lower floor, and are separated also by currents of air.

As this conversion of vitreous substances into a filamentous or fibrous material is a mechanical one, we find the wool to be of the same composition as the slag, so that, if the composition of a slag be previously ascertained, the character of the resulting wool may, in a measure, be determined.

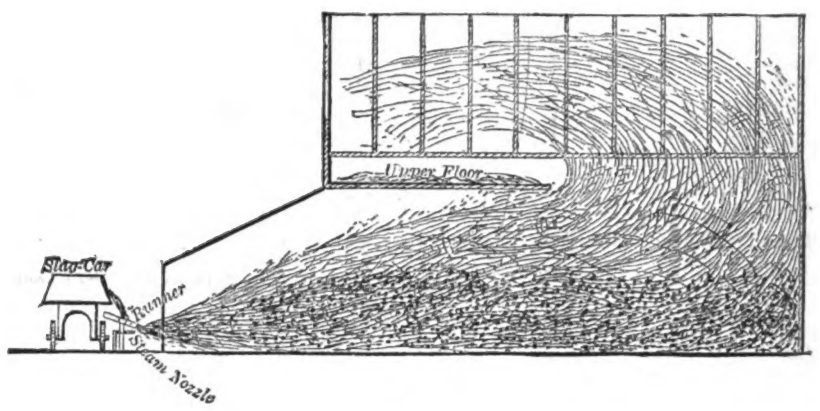
The density of bodies, generally speaking, determines the rapidity with which heat is transmitted through them, and accordingly we find the metals to be best conductors, and stone-earthenware and plaster not so good, while porous or air-confining substances constitute the so-called non-conductors. The gases are very poor conductors, and probably air is the worst conductor known, that is, it is the substance which, when at rest, impedes the passage of heat most. But heat is conveyed through air by the movement of its particles, which is obviously not the case in more dense media; therefore, we should infer that, if the circulation of the air were some suitable absorbent, the passage of heat would be retarded. This brings us to a clear conception at last of what a non-conductor ought to be, and it might not be out of place here to recall to mind the fact that birds are clothed with feathers and beasts with hair as a protection against cold, and that these coverings are poor conductors, simply because they hold in suspension an enormous amount of air. In order to ascertain how much air is confined in mineral wool, we will consult figures a little. A cubic foot of slag weighs 192 lbs., while a cubic foot of No. 1 mineral wool weighs but 28 lbs.; No. 2, 16 lbs. and No. 3, 8 lbs.; thus showing as a result of the conversion a decrease in weight, which is equivalent to an increase in air-space of 85 per cent., 90 per cent., 95 per cent., for the three grades respectively. The immense expansion is better illustrated, perhaps, by saying that one cubic foot of slag will make 24 cubic feet of No. 3 mineral wool, which would cover 192 square feet two inches thick.

A substance, to be a superior non-conductor for application on heated surfaces, should combine great air-confining capacity with indestructibility, which means that it should contain nothing organic. To further substantiate these statements, which might otherwise appear hypothetical, a few experiments have been made after the method used by Count Rumford in 1792, when he ascertained the relative degrees in which furs, feathers and other organic materials used for clothing conduct heat.

The ball and stem of a thermometer were covered with a inch thickness of the substance to be tried, by placing it within a larger bulb of glass and then filling the surrounding interval between the two with the substance; and after heating this apparatus to a given degree in boiling water, it was surrounded by ice, and the comparative times required to cool the thermometer a certain number of degrees was noted. The figures following the names of the substances mark the number of records required respectively for cooling down the thermometer through 60 degrees Fahrenheit: Asbestos, 390; cotton, 438; felt, 463; mineral wool, 770 Of course cotton has no bearing on the subject under discussion, except that it is used for domestic purposes as a poor conductor of heat, but asbestos and felt are used extensively to protect heated surfaces.

It is a characteristic of organic substances that they gradually become impaired by heat, are liable to burn; and there is no reason to suppose that felt has lost this unfortunate property. There is a disparity in the weights of these substances which favors the felt. The space filled being the same in all cases, the relative weights were noted as follows Felt, 310 grains; mineral wool, 757 grains; asbestos, 2483.

For the coating of steam boilers, cylinders, steam domes, pipes, etc., mineral wool is especially valuable. It is economic, durable, and very easy of application. It can be applied underneath wooden lagging or sheet iron. These can be kept at a uniform distance from the boiler by runners or studs, and the mineral wool stuffed under as the lagging is put on. The strips forming the lagging should be tongued and grooved and seasoned to prevent their warping afterward. The wool must not be stamped in so as to crush it, but must simply be loosely pressed, so as to thoroughly fill the open spaces. For the up-take in marine boilers, which are often carelessly covered with combustible materials, and cause frequent alarms of fire, mineral wool is particularly adapted, because it cannot possibly burn. Thin sheet iron makes a very neat and lasting jacket, and is readily bent over the boilers before the wool is stuffed in.



PLANT FOR THE MANUFACTURE OF MINERAL WOOL.

In consequence of the looseness of mineral wool, its application to pipes requires some device for holding it on. Where a pipe runs underground or in the open air, a common box answers every purpose, and for inside work canvas makes a suitable jacket, if it is properly kept in place by collars or studs. Vulcanized fiber is a material admirably adapted for a covering, because it is pliable and yet of sufficient stiffness to keep in shape while packing. It has a brown color, and is generally varnished so as to withstand the weather, it should be put on in sections of about a foot at a time, and secured by small brass clasps placed at intervals of 3 or 4 inches.

Mineral wool should be applied between 2 and 8 inches thick. The No. 1 quality is used for lining large ice houses, brewers' vaults, etc., and is put in with best results 4 inches thick, at a cost of 12½ cents per square foot. A square foot of No. 2, two inches thick, costs 10 cents, and one of No. 3 costs 20 cents. This material is receiving wide introduction in England under the name of slag wool, and it has also been in very general use in Germany, where it is called silicate cotton. The process for the manufacture of mineral wool and its manipulation are protected by five United States patents, the rights for the use of which in the different States or parts of them must be secured from Mr. A. D. Elbers, 26½ Broadway, N. Y. Mr. Elbers is the sole agent for the sale of mineral wool in this country.—*Iron Age.*

SAND FOUNDATIONS.—A block of stores is now building in Hartford, Conn., for which the foundations are laid in this way: Trenches are dug down to the hard pan, and are then filled with water. Beach sand is then sifted in until the trenches are filled with the soaked and compacted sand, which is covered by a thick layer of concrete, which in turn is to receive the stone work of the foundation walls.

A NEW soap has been patented in Germany which is composed of common soap with the addition of phosphate of soda. It is said to have especially good cleansing qualities, and to be adapted for use in salt as well as fresh water.

Communications.

Our Washington Correspondence.

To the Editor of the Scientific American:

The business of the Patent Office still continues on the increase. For the week ending December 1 the receipts were $12,975.55; for the succeeding week, $14,562.25; and for the week ending December 15, $14,735.65.

PATENT OFFICE DECISIONS.

In the interference case of Callahan *vs.* Bloomingdale and Kilmer, the latter having in his preliminary statement positively set down the date of his invention as the latter part of December, 1875, and stated specifically what he did at that time, now, after his opponent has filed his testimony, makes a motion to amend his preliminary statement, on the ground that he had made a mistake and that the date of his invention was two months earlier; the Commissioner has decided that as Kilmer did not apparently discover his error until after the opposing party had filed his testimony, he ought not to be allowed to amend his preliminary statement, as it is precisely such cases as this that the preliminary statement is intended to meet. If Mr. Kilmer's memory is defective, and he made his preliminary statement without consulting his witnesses, he should, the Commissioner thinks, have made the correction at an earlier day, and not have waited until he had an opportunity to examine his opponent's testimony. To allow a correction after the taking of the testimony of his opponent and the disclosure of the opposite case, the Commissioner holds would be a very dangerous precedent, and the motion was accordingly denied.

The practice referred to by the Commissioner as to amending a preliminary statement has, however, been varied in at least one instance. The case of W. D. Brooks may be cited as an example (*Official Gazette*, vol. VI., page 296) in which Brooks sought to amend his preliminary statement after the testimony was in, on the ground that at the time of making it he was under treatment of a physician for a nervous dis order that greatly affected his memory; and as he produced affidavits from his physician and six other persons that at the time the preliminary statement was made Mr. Brooks was not of sound mind, that his memory was very much affected, especially as to the matter of dates, not being able to remember one day what was done on the previous one, and seemingly having no recollection at all of the times at which remembered events took place, Commissioner Leggett decided that he should have liberty to amend his case to make it coincide with the testimony taken; or in case Mr. Brooks was still in such a condition as to preclude his making such a statement, and swear to it from his own memory, the case was to be decided upon the testimony as taken, regardless of the preliminary statement.

The interference of Washburne *vs.* Evans *et al.* (improvement in barbed wire fences) was originally between Washburn, Evans, Hill, Brown, Crandall, and Haish; but Washburn having so amended his case that in the opinion of the primary examiner it did not interfere with any of the patents except Evans', he declared a new interference between Washburn and Evans. Crandall and Haish, having been left out of the new interference, appealed to the Commissioner against the dissolution of the original case. The Commissioner on examining into the matter came to the conclusion that there was no patentable subject matter common to the cases of Washburn, Evans, Crandall, Brown and Hill which was not included in the patent of Haish; and he expressed his surprise that the patents of Crandall, Brown, and Evans should have been granted in view of Haish's patent of earlier date. These patents being, as the Commissioner states, beyond his jurisdiction, no action of his can affect them, but he objects to authorizing the issue of any other patent for the same subject matter shown in those already granted. The invention in controversy, as stated in the letter of the Interference Examiner, appeared to the Commissioner to include not only what is shown in Haish's patent, but also what is shown in any one of the other patents, and therefore there cannot, in his opinion, be any contest between Washburn and Evans, without also involving a contest with Crandall and Haish. Unless, therefore, Washburn so restricts his claim as to avoid the subject matter shown in the other patents, the Commissioner decides that the original interference with all the parties must be reinstated; but if Washburn limits his claim to the special device shown in Figs. 1, 2, and 3 of his drawing, and eliminates the other matter, the Commissioner thinks that the patent may be allowed.

CONGRESS.

A bill has been introduced by Mr. Barnum into the Senate which enacts that "no patent which has been heretofore amended by introducing new matter into the specification, and reissued under section 53, chapter 230 of the Statutes at large, or under section 4,916 of the Revised Statutes, shall hereafter be declared invalid by any court of the United States, for the reason that the Commissioner of Patents was not authorized by said sections of said statutes, in the case of any patent in which there was neither model nor drawing, to admit proof that the new matter or amendment was a part of the original invention, and was omitted from the specification by inadvertence, accident, or mistake."

Mr. Errett has introduced into the House a bill authorizing the Commissioner of Patents to extend the patent of Calvin Adams, granted February 24, 1857, for a beveled keeper for door locks, which has been already once extended.

Another bill introduced by Mr. Loring into the House extends, without reference to the Commissioner of Patents, for seven years, the patent of J. W. Fowle, granted March 11, 1851, and extended in 1865 by the Commissioner, which extension expired in 1872, since which time the invention covered by it has been public property. The claim covered substantially the use of a "drill attached to the cross bar of the propelling engine, piston rod, or an elongation therefrom, in such a manner that the drill is driven by the direct pressure of the motor upon the piston."

A bill introduced into the Senate by Mr. Conkling authorizes the Commissioner to extend the patent of E. H. Hosford, granted April 14, 1856, extended by the Commissioner in 1870, for pulverulent acid for use in the preparation of baking powder and other purposes.

Another Senate bill proposes to pay to the heirs of W. A. Burt, deceased, "the sum of $150,000, to compensate them for the use by the United States, in the prosecution of the public surveys, of the solar compass invented by said W. A. Burt."

The Woodruff Scientific Expedition has had a bill introduced into the Senate by Mr. McDonald, which authorizes the Secretary of the Treasury to grant for the purposes of the above expedition a register to a foreign built steamship, and authorizes the president to detail officers of the army and navy, not to exceed five each, for duty with the expedition, who shall report and transmit to the chiefs of their respective departments scientific data and material. The vessel is to be approved by the Secretary of the Navy, and a school is to be maintained thereon with a capacity for at least 200 scholars.

In the deficiency bill passed just before adjournment is an item appropriating $5,000 for adapting the Babcock lakes in the monumental grounds for the culture of the carp. The carp is said to be a hardy fish, particularly well adapted to the southern waters of our country, and it is hoped that it can be readily made the source of an abundant supply of food. One advantage the carp has over most fish is that he lives mainly on vegetable food, and hence is not so destructive to other fish. It is estimated each pound of bass raised requires the consumption of five pounds of other fish, or a corresponding amount of other similar food. The appropriation is to be used for propagating the carp here, whence they are to be distributed, as soon as they are of proper age and size, throughout the country wherever the waters are suitable for them.

Congress has of late been flooded with petitions relative to the proposed change in the tariff, most of which request that Congress will take no action concerning it until after it shall have ascertained, by an official enquiry, the condition of the industries of the country, and the nature of such tariff legislation as, in the opinion of practical business men, would best promote the restoration of general prosperity. Would not it be a good idea for inventors to interest themselves in procuring and forwarding petitions against the proposed alteration in the patent law? There are, it is true, many good points in the bill, but the sections referred to in your article in No. 24 of the last volume should certainly be eliminated. Let every inventor, patentee, or owner of a patent, or an interest in one, therefore, get up a petition and forward it to the member for his district, so as to be ready for presentation at the re-assembling of Congress on the 10th of January. In addition to the petition, let each one interested in patents make it a point, if possible, to call on the Congressman and Senator for his district, who are now probably home for the holidays, and explain to them the objections to the clauses above referred to, showing them how difficult it is, even under the present law, for an inventor to realize anything at all commensurate with the advantages he confers on the country, and how much more difficult it will be should the objectionable features of the proposed act be incorporated on our present system of patent law.

THE PARIS EXPOSITION.

Gen. Le Duc of the Agricultural Department is studying up the method of arranging his exhibits, and what will be the best articles to send. He proposes to send samples of all our staples and many of the machines used in their preparation. For instance, with the wheat exhibit, he proposes to send a flouring mill, in which the patent process of middlings separation may be shown, the product of which will be disposed of to show what we can do in this line. With cotton will be exhibited a cotton gin, to be run at certain hours, and also everything connected with the cultivation and preparation of our most important export. Cuttings of every variety of our woods, and special products of our forests, as the southern moss used in upholstery. The dairy products of the north, with a model dairy. Honey and the improved methods of bee culture. Maple sugar, with the sap and the syrup. The various kinds of tobacco and the processes of the preparation. Fruits of all kinds, and the processes of drying, canning, etc. Dyestuffs and tanning materials. Broom corn, its cultivation and manufacture into brooms. Rice in various stages of growth, and the processes of preparation for markets. The different species of corn, and all its products.

It is proposed to have a woman's department, and a lady assistant commissioner will probably be appointed to take charge of it.

THE IMPROVEMENT OF THE MISSISSIPPI.

A telegram has been received here from New Orleans, stating that Captain Brown's latest official survey of the channel at the South Pass shows a depth of 22 feet and a width of 200 feet, which entitles the contractor, Mr. Eads, to a second payment of $500,000.

In addition to these works at the mouth, it is proposed to aid navigation, by means of reservoirs, upon the head waters of the river, by which it is thought that good navigation may be obtained all the year round, as the floods may, by such reservoirs, be controlled and used to keep up the volume of water at the period of low water. It is thought, however, by some that such reservoirs had better be located at the headwaters of the St. Croix, Chippewa, and Wisconsin rivers (tributaries of the Mississippi), by means of dams, which will serve the double purpose of regulating and improving the navigation of said rivers, as well as the Mississippi, and the Secretary of War has been requested by a joint resolution of Congress to make a preliminary examination of the headwaters of those rivers, to "determine the extent and the practicability of reservoirs upon the same," and to report the result to Congress in February, together with a compilation of all information and reports in his office bearing upon the subject of reservoirs, for this purpose.

MAGAZINE GUNS.

One of the provisions of the army bill recommending the expenditure of $20,000 for the manufacture of a magazine gun, the Secretary of War has appointed a board to assemble at the Springfield (Mass.) Arsenal, April 3, 1878, to consider and experiment upon such guns as may be brought there for inspection and trial, and to recommend the one considered most suitable for manufacture, should one be found worthy. All persons interested in magazine guns are invited to send samples for trial.

Washington, D. C. OCCASIONAL.

Gas Poisoning.

To the Editor of the Scientific American:

In the SCIENTIFIC AMERICAN of the 15th is an article from the *Lancet* on poisoning from the common use of illuminating gas. The concluding period is: "It is not creditable to the ingenuity of practical men that no method has yet been discovered by which the advantages of gas as an illuminating agent may be secured without the drawback of slow poisoning, with the host of maladies a depressed vitality is sure to bring in its train."

I have seen in Europe an excellent contrivance to meet the difficulty alluded to. It consists in a glass globe of whatever size may be required for the apartment, whole at the bottom and illuminated with gas. The globe is closely connected with the fixture by which it is suspended, so that there can be no escape at the top of any of the products of combustion.

This fixture is of bronze, like that of a chandelier, about three inches in diameter, variously and tastefully ornamented. This fixture is connected with a small flue concealed by the plastering, and this flue communicates with the chimney or some other avenue to the open air. The products of combustion pass off through this channel, and air is admitted into the globe to support combustion by the same way through a small separate pipe. The air might be supplied through minute holes at the bottom of the globe.

The glass is often ground, but I have seen it elaborately cut, and the globes are sometimes as large at two feet in diameter. The result is a uniform and perfect light in every part of the room. N. D.

Portland, Me.

The Telephone as a Time Regulator.

To the Editor of the Scientific American:

Allow me to mention an application of the principles involved in the telephone which has not been suggested, so far as I know. It applies to the regulation of clocks to a standard timepiece, and may be made local or general.

Let the pendulum of the regulator oscillate immediately above a permanent magnet wrapped with coils of insulated wire, the same as the telephone. Let the wires from this magnet form a circuit connecting other similar magnets placed one under the pendulum of each clock to be regulated. While each stroke of the regulator will affect its magnet and thus induce a current, which in turn will affect the other magnets, the regulator itself will be equally affected by the other pendulums along the line, and the result would be a rate the mean of all the clocks.

To obviate this the regulator must control the secondary pendulum without itself being influenced by it or the other clocks. This can be done in various ways. A simple one is by making and breaking the circuit of a local battery controlling the secondary pendulum. This secondary pendulum must induce sufficient magnetism to control the sum of that induced by all others along the line, and this will again be more or less, as the rates of the various clocks, or their mean rate, varies from the correct one. C. A. LOCKE.

Atlanta, Ga., December 12.

A New Regulator for Electric Lights.

M. Armand Billon describes in *Les Mondes* a new regulator for the carbons of the electric light, which consists of a parallelogram articulated after the manner of the Watt governor. On the lateral arms are fixed the carbons, which are placed either in angular position or on the same line, as desired. They are brought together by means of a spring and separated by an electric magnet. These two movements are imparted directly to the parallelogram, so that the effect is instantaneous.

BUILDINGS OF THE PARIS EXPOSITION OF 1878.

The engravings of the Paris Exposition of 1878, which we present this week, are a general view of the French capital, showing the location of all the exhibition buildings and a representation of the central entrance to the main vestibule of the chief structure. We have already fully described the two great edifices in which, it is now asserted, the greatest World's Fair ever known will be held. On one side of the Seine, on the Champ de Mars, is the Exhibition building proper, and on the other, on the Trocadero, the palace which will be mainly devoted to art handiwork. The total floor space covered by both buildings is 2,150,000 square feet. The palace of the Trocadero is from one pavilion to the other about 1,330 feet in length, the pavilion at the extremities being connected with the great central rotunda, from the foot of which will flow a cascade, by galleries forming segments of a semicircle. From all parts of Paris, the two immense towers, 260 feet in height, which flank the Trocadero, will be visible.

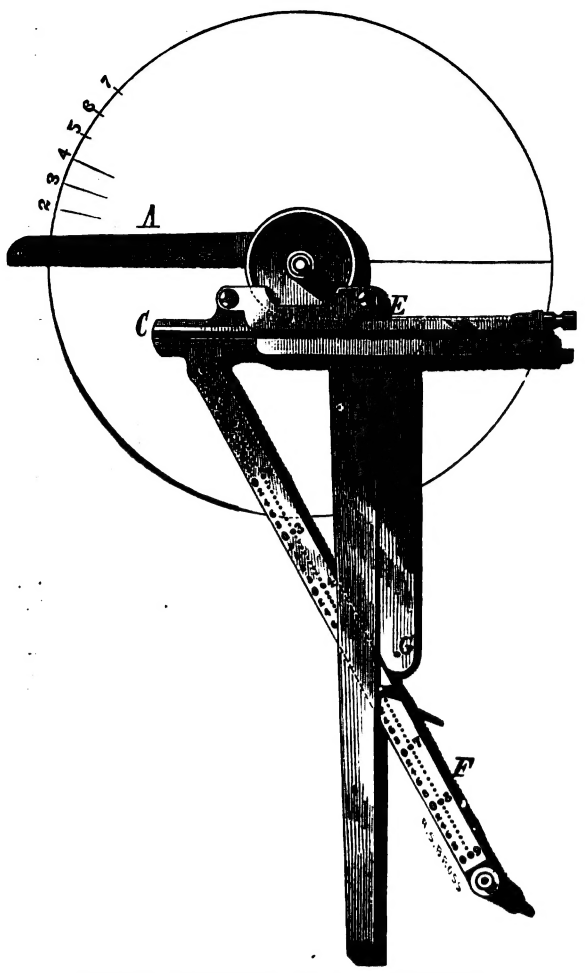
The principal entrance is to be at the middle, and at each end are two immense domes of iron and glass, surmounted by lanterns and flagstaffs. The gardens stretch out from each side of the façade between the palace and the avenues, and will contain a number of small buildings, kiosks, model farms, cottages, and the like. The height of the new structure may be imagined when it is stated that that of the vestibule is 82 feet.

Commissioner General McCormick has opened his office at room 24, second floor of the New Post Office building in this city, and to him applications for space may now be made. The space allotted to the United States in the Main Building adjoins that given to Russia, and measures 400 by 100 feet. Of this three fifths will be given to industries, one fifth to machinery and one fifth to food products. Already over four hundred applications for space have been filed, the American Union of Paris Exhibitors having turned over all their business to the Commissioner. Printed forms can be obtained by addressing the Commissioner General as above.

STOLP'S COMPLETE GEAR INSTRUMENT.

Of the various contrivances used to transmit and modify power, toothed gearing stands second, if, indeed, it cannot justly claim the first position in the order of importance. Ready means for its correct construction should therefore be in the hands of all designers. But the great abundance of rattling machines, put in places where we ought to find truthful gearing, indicates that sufficiently simply and easy means for correct delineation are not at the hand of the majority of designers. The instrument illustrated herewith is claimed to so far remedy this evil as to leave no longer any excuse for noisy gearing. It divides the circle, or any part of it, into any desired number of equal parts or pitch spaces; finds the radius of a circle of given pitch; gives the length and thickness of tooth according to any given rule; forms a substitute for the Willis odontograph, giving the centers for the tooth curves; or gives the lines to be used for placing in position the new templet odontograph.

A is an arm or straight edge attached radially to a central wheel, B, so as to swing with it, to any position on the arc



STOLP'S COMPLETE GEAR INSTRUMENT.

to be divided. B is mounted upon a hollow taper stud, which projects up from an extension from the main frame or bed piece, C. A centering pin is passed through the hollow stud into the drawing board, to center the instrument, and a second pin is attached in the end of the arm, G, to be pressed down to fasten the instrument in position. A T square, E, fits to slide nicely in dovetailed groove in bed piece, C. A clip, D, holds the T square properly in the groove. A steel wire attached at one end of the head of the T square, passes around the wheel, B, and is there fastened to it. A second wire is secured to the opposite end of E, passing in the opposite direction around B, and there made fast. A thumb screw takes up the slack Now when B and A revolve around the center stud, the T square is made to slide in its groove by the wires winding and unwinding from B. It is evident that, when A thus swings through equal angular spaces, the long arm of the T square will be displaced laterally by equal spaces.

Now if any scale of equal parts be placed under the arm of E, to be used as a guide in turning A, it is plain that equal spaces or angles will be laid off on any circle concentric with B, also if the scale be inclined more or less, say like the bar, F, these inclinations will result in different angles at A. Hence if, for instance, any scale be set at such an angle under E that 50 divisions are passed over by E while A moves through 180°, the semicircle will, of course, be divided into 50 parts; in like manner any arc may be divided into any number of parts, also any angle can be laid out.

But ordinary scales will require careful sighting. Each instrument is accompanied with one or more scales formed by drilling holes in a bar, F, into which a pin is set at the desired places, thus forming a stop for E; one end of F is jointed to C, and the other is secured to the drawing by an adjusting pin.

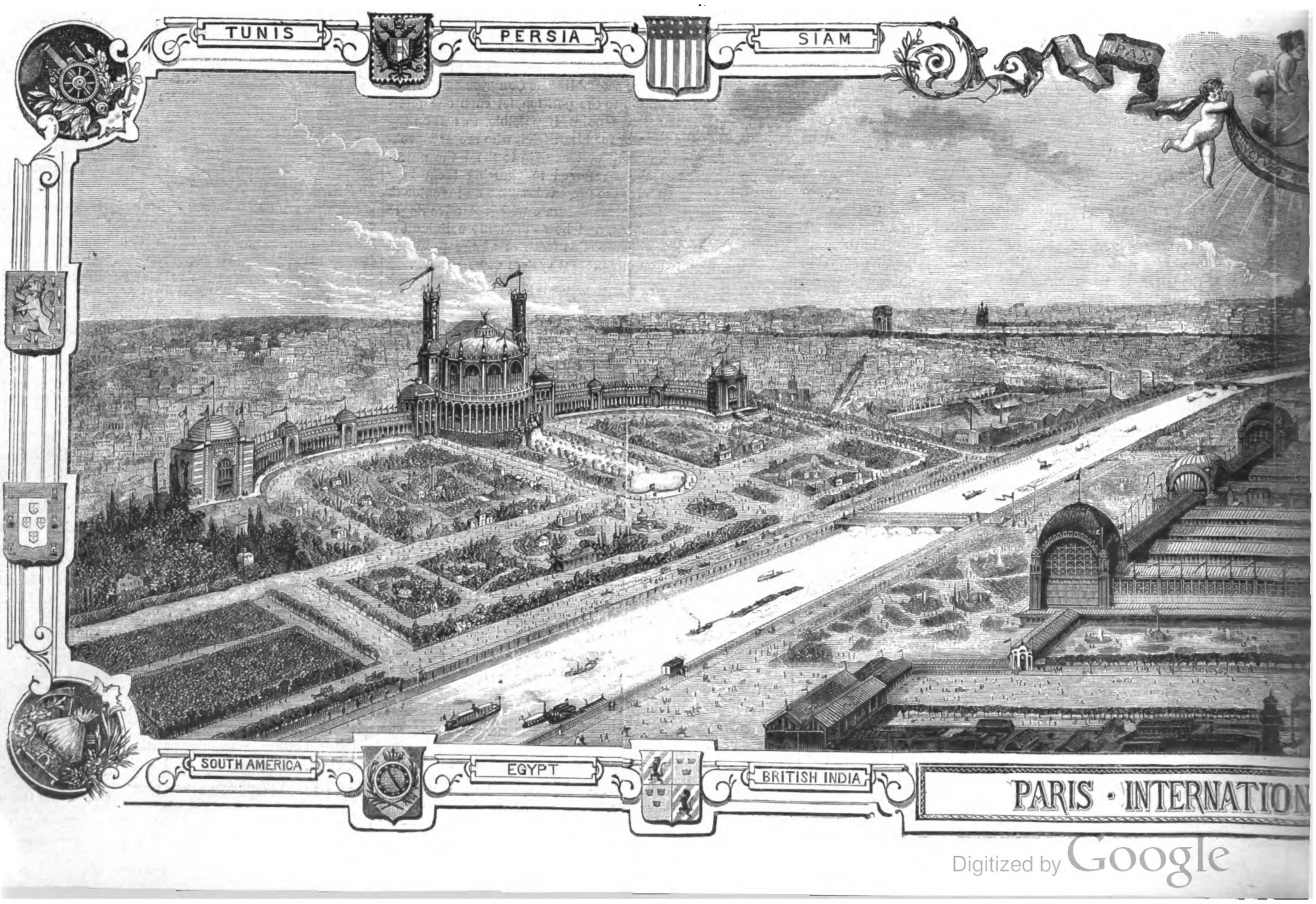
Now, for the first operation above named, center the instrument and place the pin in F at its zero point; then with F against the pin, place A at the initial point of the arc, secure bed plate, C, by pressing in pin, G, into the board; then remove A to the other end of the arc to be divided, at the same time placing pin in F at the hole whose number equals the number of divisions required in the arc or circle to be divided. The points of division are then noted by a pencil or scribe while E rests against the pin for each position in F. The arc divided at one fixing of G may be 180° or less. To divide the other half of the circle, place G at a new position distant 180°, and proceed as before. The operation is the same for an odd number as for an even number of divisions.

We have not space to describe in detail the other operations of the instrument, full particulars regarding which may be obtained by addressing the inventor as below.

In addition to its capabilities already noted, the device gives the correct shape for the cutters of a gear cutter and the size of the blanks to be cut. It is easily worked and understood, and is claimed to reduce the tedious and difficult operation of laying out correct gearing to a very simple proceeding.

Patented by M. G. Stolp, Civil Engineer of Aurora, Illinois, who may be addressed for further information.

M. J. SCHUMEISTER has recently experimented on the heat-conducting power of silk, cotton, and wool. That of air being taken as unity, he finds that of cotton to be represented by the number 87, of silk 11, and of wool 12.



Bell's Telephone.

At a recent lecture by Professor Bell on the speaking telephone, Sir William Thomson introduced the lecturer to the audience by the following remarks:

"That evening there was to be brought before them one of the most interesting of the scientific inventions that had been made in this century, or that had ever been made in the history of science—(applause)—the conversion of the quality of speech into motions of electricity, and the reproduction of the effect in audible sound. (Renewed applause.) They might have heard of telephones before that which was now to be brought under their notice. There were telephones before that of Mr. Graham Bell, but those telephones differed from Mr. Bell's in the same sense as a series of claps of the hand differed from the human voice. The previous telephones were in fact electric clappers. (Laughter.) They were instruments in which, by electric action, a succession of shocks, produced by stopping and starting the electric currents suddenly, were produced. Mr. Graham Bell conceived the idea—the wholly original and novel idea—of giving continuity to the shocks, and of producing currents which would be in simple proportion to the motion of the air produced by the voice, and of reproducing that effect at the remote end of the telegraphic wire—reproducing that effect at distances of a few miles, or of scores of miles, with a motion as nearly similar to the motion of the air caused by the voices as that not only was the articulation of the voice heard distinctly, but the different qualities of different voices are heard—(applause)—so that through the telephone, at a distance of 50 miles, one could not only tell what the words were that were being spoken, but they could tell who the person was that was speaking of all the 900,000,000 people living on the earth."

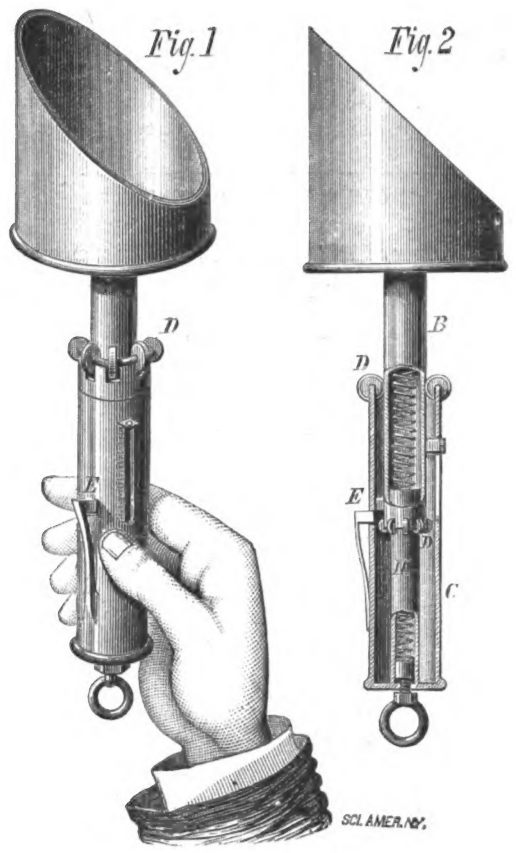
Iridescent Glass.

A process for making glass iridescent has been patented by M. Clémandot. Beautiful effects are produced. The main feature of the process is the application of acids to the glass, under a pressure of from two to five or more atmospheres. Water containing fifteen per cent of hydrochloric acid is used to bring out rainbow tints like mother-of-pearl; and artificial gems of various sorts are have thus been manufactured. The glass is prepared by these processes is quite as iridescent as is that which antiquaries so much value, the pressure and the acids hastening a result that the ordinary agencies of the atmosphere would take centuries to produce.

THE steamer City of Berlin, which became disabled on her last voyage from New York to Liverpool, was lately put on the dry dock. An examination shows that the screw shaft was not broken as was supposed, but that the key of the propeller had given way and the screw became loose on the shaft.

MERY'S WEIGHING SCOOP.

The annexed illustration represents a novel combination scoop and weighing device. The scoop has its movable stem, B, Fig. 2, sliding in the handle, C, and outside the spring case, H. The rollers, D, serve to keep the stem in position, so that the stem may work free; also to prevent friction while weighing. A similar set are fixed to the lower end of the stem, so as to work between the outer and inner case. A



spring stop, E, is so arranged on the handle as to be directly under the thumb when the handle is grasped, and a slight pressure of the thumb on it when the scoop is thrust in any material, prevents the stem from being pressed back. A spiral balance spring plays within the case, H, and is made fast to the inside lower end of the handle. A nut and thimble at the lower end adjust the tension of the spring. A graduated scale is fixed on the handle. When the material to be weighed is raised up in the scoop, the stop is released, and the balance being free to act, the weight of the material will show on the scale. This arrangement of the scoop and scale gives two useful articles in one, and is very serviceable where a large amount of material has to be divided by weight into small quantities. The arrangement of the thumb stop protects the spiral balance from damage, and facilitates the scooping up of any hard, unyielding material. It is an article which will meet with much favor in the household. Patented October 16, 1877. For further information, address the inventor, Michael L. Mery, Chico, Cal.

New Inventions.

In a Car Coupling patented by Warren Montfort, of Eminence, Ky., the drawhead has a top recess tapering rearward and downward. The top shoulder has a lateral recess forming a shoulder. A hook-shaped drop pin, tapering downward, fits into the recess of the drawhead. The entering link pushes the hook back, raises it into an inclined position, and finally passes far enough back so that the hook, by its own weight, drops into the link. It is simple and effective.

Washington Wilson, of New York city, has patented a Standing Collar which has sectional bands, starting from the center of the collar and continuing, with a graduated curve, to and beyond the ends. It produces a saving of material and hugs the neck band in superior manner.

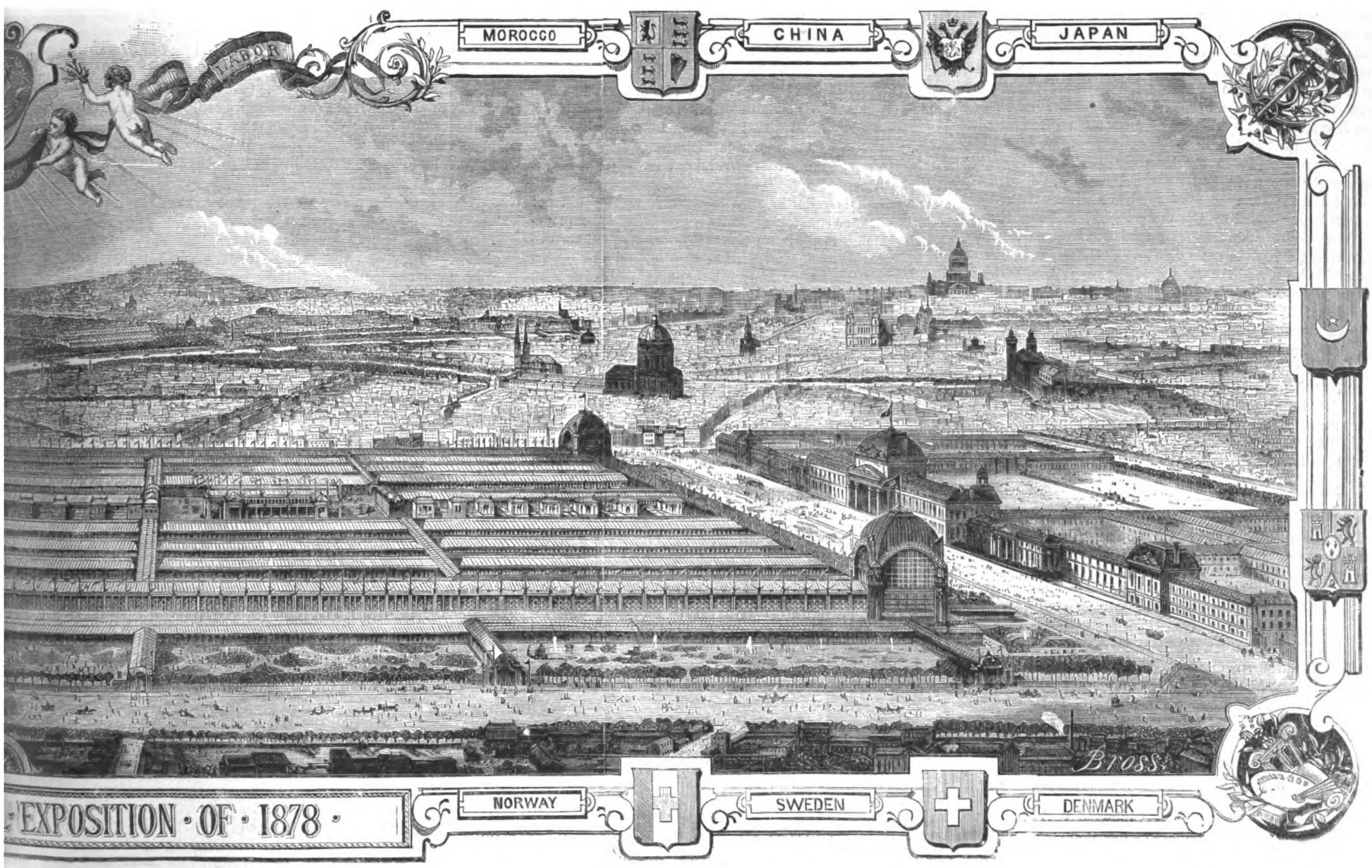
A Nut Lock invented by Madison Calhoun, of Ocate, New Mexico Territory, consists in the combination of a plate, having its ends bent down and an oblong hole in its center, and another plate with a screw hole formed through its center, and provided with points susceptible of being bent down with the nut and the flattened end of the bolt. It is convenient in use and effective in operation.

A Washing Machine has been patented by J. C. Smith, of Ashton, Ill. By moving crossbars back and forth, two rubbers move over each other, rubbing and pressing the clothes between them, and making them clean in a very short time. The action is similar to hand rubbing, the rubbers always moving in opposite directions.

An Adjustable Ladder patented by George Crawford, has a curved arm and pivoted bar for catching in trees and holding the ladder firm. Notched plank rest on transverse rods, secured by a simple device. It is of much value to painters and carpenters.

A Cooking Stove invented by G. A. McFadden, of Jordan Station, Ky., has a damper at the forward end of the oven, with a flue extending along the top, down its rear side, and connecting with a flue at its lower rear corner, and also a flue extending down the forward side, along its bottom, and connecting with a flue at its lower rear corner. Heat may thus be sent in equal quantities above and below the oven.

A Book Support patented by Almon Clarke, of Sheboygan, Wis., had a double supporting arm, which is adjustable as to height and angle of inclination on a screw post of the chair by a toothed clamp and guide device, the book rest being adjusted by a second toothed clamp device at the upper end of the supporting arm. It is a cheap and convenient article.



One-Legged Railway.

An Oil City *Derrick* correspondent describes the elevated one-wheeled, or, as it is more generally known "one-legged railroad," now being constructed by General Stone in the Bradford oil region. It is attracting a good deal of attention, and there is much speculation as to the probable success or failure of the enterprise. A portion of the line between Bradford and Tarport is completed, and one car of peculiar construction has arrived and been placed on the track. The construction of the road is simple, rapid and easy. On the hard ground logs six feet long and from a foot and a half to two feet in diameter are placed at right angles to the line, and from twelve to fifteen feet apart, the distance varying. In these logs vertical sawed posts, fourteen by fifteen and a half inches, are dovetailed and wedged. These verticals vary in height, and by their length the grade of the road is regulated. On the top of these verticals the horizontal pieces to which the rails are spiked are laid, with their ends squarely against one another. These sleepers are ten inches wide by fifteen and a half in thickness. By a proper arrangement of vertical and horizontal pieces of timber the timbers on which the rails are laid are kept firmly in position, and two wooden rails, three feet and a half below the top of the iron rail and twenty-two inches apart, are spiked to the vertical posts. Across streams and the swampy ground piles are driven. On this one rail a saddle-shaped car is mounted and supported by two wheels, double flanges. The gondola car now mounted on the portion of the road completed is twenty-two feet long, nine feet wide, and weighs over seven thousand pounds. The car is a double decker, there being room for freight in the body of the car, and on each side of the saddle. Twenty-two inches below a plane tangent to the upper wheels, at the lowest point of their circumference, four smaller wheels are placed in a horizontal position, and in the same plane, their circumferences being twenty-two inches apart. These run against the wooden guide rails, and keep the car in position. The wheels are attached to standards connected with the iron framework of the car.

Dental Caries.

The general prevalence of dental caries is chiefly owing to food remaining on and between the teeth after meals—from breakfast time till the following morning—when, according to custom, the teeth are brushed; brushed, but probably not cleaned, as the brush is more often used to polish the surface merely than to assist in removing what has accumulated between them. Experiments have been referred to that prove the solvent action of weak acids on the teeth; and I think it will be conceded without proof that, were portions of our ordinary food, mixed and moistened as in mastication, kept during the night at the high temperature of the mouth, the compound would be sour. It follows that dental caries must continue to prevail as now, while it is the custom to allow the food to remain in contact with the teeth all night.

The following observations show the dependence of caries on food remaining in contact with the teeth. When the teeth are wide apart food is not retained, and they generally remain free from caries. The lower front teeth are seldom attacked by caries when, as is generally the case, the spaces between are closed to the entrance of food by tartar. The backs of all the teeth, upper and lower, being kept free from food by the tongue, are seldom affected by caries. Lodgment of food takes place between the bicuspids, between the molars, in the depressions on the masticating surface of these teeth, and on the buccal walls of these molars, and these are the chief seats of caries. While mastication is performed by the molars and bicuspids, the upper front teeth remain free from food and from caries; but, when they themselves are made to do the work of lost or diseased molars, and the food gets between them, caries is certain to follow before long. Further proof cannot be required that, if no food remained in contact with the teeth after eating, they would be free from caries, unless acted on by acidity from other sources. The only indications, therefore, for the prevention of dental caries are the neutralization of acid applied to the teeth and the removal of food before it has become acid. The food should be removed after every meal, and all who have not the opportunity of doing so should not fail to remove it every night at bedtime by rinsing, as the brush cannot be trusted to remove the food from between the teeth.—*British Medical Journal.*

Ancient American Cliff and Cave Dwellings.

There have been just added to the South Kensington Museum, London, six models (the gift of the United States Government), illustrating the cliff houses, cave dwellings, and lowland settlements met with through the district where the States of Utah, Colorado, Arizona, and New Mexico join. They are reduced to different scales, the cave dwellings being of smaller scale than the lowland dwellings, since with the former the surroundings are given, while with the latter they are not. The district, which may be called that of the San Juan basin, was surveyed in 1875, and last year some attention was paid to the ruins of ancient dwellings that had been previously noticed. The area examined was 6,000 square miles. The general aspect of the country is that of a semi-desert. Yet there is a bountiful evidence that at one time it supported a numerous population; there is scarcely a square mile in the whole 6,000 examined that would not furnish evidence of occupation by a race totally distinct from the nomadic savages who hold it now, and in every way superior to them. The ruins of the region are those of stone structures, but the remains are not so perfect as to show to what extent wood and adobe were used. The only known traces of the people besides their dwellings are flint and stone implements, tied bundles of sticks, fragments of matting, pottery, and pictures cut into the walls. A number of burial places were noted, but of the graves examined few yielded further evidences of occupation than small quantities of charcoal and bits of painted pottery. As regards the buildings, the parallelogram and the circles are the predominant forms. A greater part of the ordinary structures are square or rectangular; while attached to each group, and sometimes without indications of contiguous buildings, are the circular ruins frequently resembling towers. The models, which are colored, give a good idea of the structures.—*London Building News.*

CURIOUS BLOOD DISKS.

BY JOHN MICHELS.

In the summer of 1877, on a visit to the London establishment of Messrs. R. & J. Beck, I purchased a slide that was offered to me, as a recent addition to their cabinet of microscopical objects for sale. It was represented as a specimen of the largest blood corpuscles known, and was labelled as follows: Blood.—Congo Snake.—Amphiuma Meaus.—R. & J. Beck, 31 Cornhill, E.C.

As it is a most interesting specimen, I offer in Fig. 1 a sketch I have made by the camera lucida, as a part of it appears magnified by my ¼ inch objective and B eye piece, enlarged 310 diameters.

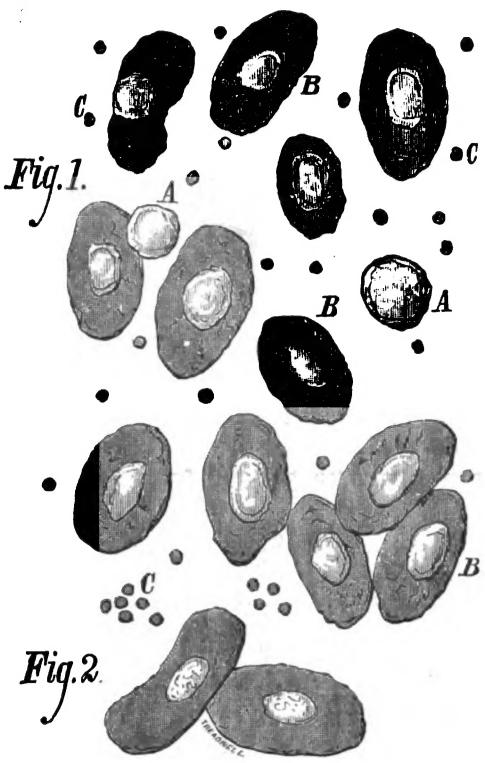


Fig. 1.

Fig. 2.

Had the preparation been offered by a less reputable house I should have considered the description on the label an error, as I am not acquainted with a Congo snake, with the above name, and the only "Amphiuma" I know of is a genus of batrachian reptile met with in the lakes and stagnant waters of North America.

As an animal similar in form to a water newt could not be mistaken for a snake, a difficulty is presented, the explanation of which it is not in my power to offer. The red corpuscles of this specimen are immense in size, and can be distinguished by the unassisted vision, and in their oval form are characteristic of those met with in reptiles.

At letter A will be noticed the white corpuscles, which are smaller in size and circular in form, and thus readily distinguished from the red corpuscles, marked B. The small circles are to represent human blood disks similarly enlarged; these are introduced for comparison of size only.

Large as these red corpuseles appear, I find they are yet smaller in size than those met with in another reptile called "menobranchus lateralis," one of the salamander family found in Lake Ontario. This amphibious animal is remarkable from being furnished with both lungs and gills, which permits it to live either on land or in water with equal comfort to itself.

Fig. 2 is a copy of a drawing of the blood disks of the "menobranchus lateralis," enlarged 300 diameters.

A comparison between the illustrations, Figs. 1 and 2, at once shows that, although the red corpuscles of the "amphiuma" are magnified 10 diameters in excess of those of "menobranchus," still the former is the smaller of the two specimens, thus the "menobranchus lateralis" must still carry off the palm of having the largest blood disks yet discovered.

A New Theory of the Nature of Water.

M. Maiche in *Les Mondes* propounds the theory reached after numerous experiments that water is simply hydrogen *plus* electricity, or oxygen *minus* electricity; or, in other words, that normal electrified hydrogen constitutes water, and that normal disclectrified oxygen produces the same; or that hydrogen, oxygen, and water are precisely the same, differing only in degree of electrification.

Compositions.

I give one fourth day each week to composition exercise. The pupils are provided with paper and pencil, several subjects are placed upon the blackboard, and every pupil required to write all he can on one subject. The subjects are selected so that all pupils are able to write. The following were used last week: Maple sugar-making, ghosts, telling stories, faces, domestic animals, rats, peanuts, observations in a railroad car. During this exercise the strictest order is observed. Pupils that experience difficulty write their subjects, and then are aided by the teacher, who is constantly among them. He does not write, however, but suggests what may be said on the several subjects, and aids them to form the first sentence. The writing continues just one hour, when compositions are folded, superscribed, numbered, and handed to the teacher. The pupils then receive compositions of the previous week, and are required to correct the errors noted on the outside. Fifteen minutes are given, then the remaining fifteen minutes is given to the correction of mistakes which the pupils failed to rectify. This is done by placing the words and sentences on the board, and calling upon different members of the school for correction. The facility with which young pupils write after a few months' practice is surprising; and while it proves a profitable exercise, it is no less agreeable to the scholars.—*N. E. Journal of Education.*

Dyeing Felt Hats.

The following is a recipe for producing a good black, and giving brightness to the felt. The quantities named are for dyeing 100 hats at one operation. Into a copper containing 55 gallons of boiling water put 9 lbs. of liquid extract of logwood at 30°, 4½ lbs. of crushed brown cashoo, 4½ lbs. sandal wood in powder, and 2½ soda crystals. Enclose the whole in a linen bag or wicker basket, so that they do not settle at the bottom of the copper. When the ingredients are dissolved, put the hats in, and allow them to boil gently for two hours; then take them out, and let them get quite cold. Now add to the bath 3½ ozs. of chromate of potash, and 9 ozs. of sulphate of copper; cool the bath by the addition of several pailfuls of water, then again put in the hats, and allow them to simmer for an hour. Again take them out, let them get cold, and after adding to the bath 2½ lbs. of sulphate of iron, put the hats in, and let them gently boil for an hour. Should the hats have a rather reddish appearance, add to the bath another 2½ lbs. of soda crystals. After these operations the hats must be piled up, and covered with a thick cloth for a day; then subject them to a vigorous washing, and eliminate the copper, using muriatic acid rather than sulphuric acid, as the latter draws out the dye. When the copper is thus eliminated, pass the hats into cold water, in order to free them from the acid. For the final operation, prepare a bath of Panama wood, just simmering, and in this place the hats for half-an hour. This bath sets the color, and gives brightness to the felt. Upon taking them out, if they are soft hats, the water must be drained out of them by pressure.

Observations.—By this procedure a very clear and very bright black is obtained. In order to produce a violet-black the cashoo must be substituted by the same weight of archil; a blue-black is obtained by leaving out the cashoo and sandal wood, and replacing them by 4½ lbs. of archil; for the burnishing the sulphate of iron must be suppressed, and replaced immediately by 1 lb. 2 ozs. of sulphate of copper; if a greenish-black tint or kind of dark bronze is desired, the sandal wood must be substituted by 4½ lbs. of liquid extract of Cuba yellow wood at 30°.—*French Hatter.*

Astronomical Notes.

BY ERELIN H. WRIGHT.

PENN YAN, N. Y., Saturday, January 12, 1878.

The following calculations are adapted to the latitude of New York city, and are expressed in true or clock time, being for the date given in the caption when not otherwise stated.

PLANETS.

	H.M.		H.M.
Mercury rises	6 59 mo.	Jupiter rises	7 09 mo.
Venus sets	8 26 eve.	Saturn sets	9 19 eve.
Mars in meridian	5 41 eve.	Uranus rises	7 50 eve.
Mars sets	0 10 mo.	Neptune in meridian	6 43 eve.

FIRST MAGNITUDE STARS.

	H.M.		H.M.
Sirius rises	6 10 eve.	Altair sets	6 45 eve.
Procyon rises	5 45 eve.	Fomalhaut sets	7 21 eve.
Regulus rises	7 48 eve.	Algol in meridian	7 31 eve.
Spica rises	29 mo.	Capella in meridian	9 38 eve.
Arcturus rises	11 27 eve.	7 stars (cluster) in meridian	8 11 eve.
Antares rises	4 31 mo.	Betelgeuse in meridian	10 19 eve.
Aldebaran in meridian	8 59 eve.	Rigel in meridian	9 39 eve.
Vega sets	7 57 eve.		

REMARKS.

Mercury rises 24 m. before the sun, and 2½° north of the sunrise point. He is now retrograding. Venus is nearly in the sun's path. She is brightest January 16. Mars is a little north of the ecliptic, and ⅞ of his illuminated disc is visible. Jupiter commences to be morning star January 5, and will so continue until April 25. He rises 14 h. before the sun, and nearly at the same point. Saturn is 3° south of the ecliptic. He is near the moon January 8, 5 h. 40 m. evening, being 4° 19′ south. Uranus is still quite near Regulus, being nearly 1° northeast of the star. The wonderful variable star Algol will decline from the 2d to the 4th magnitude between January 13, 0h. 33 m. morning, and 3 h. 57 m. morning; also between January 16, 9 h. 22 m. evening, and 12 h. 46 m. evening, increasing to the 2d magnitude at 4 h. 10 m. morning of the 17th.

STEAM SYPHON PUMPS.

In a great many cases where water is required and it has to be raised or pumped, there are no simpler contrivances than those illustrated in the annexed representations. Fig. 1 shows a form of steam syphon for stationary work, and Fig. 2 represents another one that is portable and more especially adapted to railway requirements, as in the case of construction trains, which are very frequently at a long distance from a regular water station. The very great simplicity of these devices may possibly raise a doubt in the minds of some as to their great and permanent efficiency, but the present and constant demand for them, and the satisfactory results obtained from the large number already in operation, are facts that speak for themselves. They are neither novelties nor speculative inventions, but of great political value and usefulness. Decrees were rendered sustaining the patented improvements by Judge Blatchford, 26th January, 1874, and 13th January, 1876, in the U. S. Circuit Court, Southern District of New York.

The principle on which they are constructed is one familiar to all scientific and mechanical men, namely, that of creating a vacuum by an injection of steam. There are no valves, rods, or complication of parts. The arrangement is simple and inexpensive: the operation certain and efficient. The manner of construction and operation will be readily comprehended on reference to the engravings. Fig. 1 represents a steam syphon pump, complete. The body, A, is made of cast iron, is hollow, and has four openings, namely, one for admission of steam, by means of a steam pipe, B; two for the insertion of suction pipes, C C; and another for the conical chamber, D, into which the delivery pipe is inserted. The operation is simply this: Steam is turned on through the steam pipe, B, and rushes across the spherical chamber, A, into D, carrying the air in A and D before it, and thereby exhausting the air from A. Water immediately rises to supply its place, rising through the suction pipes, C C, by atmospheric pressure, as in ordinary suction pumps, when the steam jet forces it onward through D, and the discharge pipe connected therewith, with a velocity proportioned to the pressure in the steam boiler.

Fig. 2 shows the manner of applying this steam syphon to fill a locomotive tender from any body of water within reach near the side of the road. A is the hollow spherical body; B is the steam hose attached to the locomotive boiler by a steam cock; C is the steam cock to be screwed into the boiler; D D are the suction orifices, and E is the discharge hose. Steam is let on through the hose, B, and water is forced through the discharge hose, E, into the tender. Every locomotive provided with this appliance can be used as a fire engine, throwing water from the tender or any adjacent water.

These steam syphons are made in sizes ranging from ¾ inch discharge to 6 inches discharge; capacities ranging from 30 to 1,800 gallons per minute. The steam syphon will lift water 16 to 20 feet, and force it one foot for every pound steam pressure employed. The quantity of steam used being very little more than by an ordinary plunger pump doing the same amount of work.

Having no valves or other movable parts, and no obstruction of any kind whatever, sand, gravel, or other similar substances pass through it as freely as clean water.

High pressure pumps are constructed to work with 30 lbs. and upward steam pressure; low pressure, from 30 lbs. down. They are serviceable as bilge pumps and as fire pumps, and are in operation at railway water stations, mines, gasworks, breweries, papermills, manufactories, etc., for filling cisterns and tanks, and for many other purposes. They are known as Lansdell's patent steam syphon pumps, and are constructed by Messrs. Leng & Ogden, 4 Fletcher and 212 Pearl street, New York city, agents for the railroad water station pumps.

Fig. 2.—PORTABLE RAILWAY STEAM SIPHON PUMP.

Cleopatra's Needle.

Mr. John Dixon, C.E., the engineer who has undertaken the task of removing from Alexandria and erecting in London the Cleopatra obelisk, lately gave an interesting lecture at the United Service Institution, on the subject of his arrangements for the conveyance of the stone to England, and the plan he purposes adopting for placing it upon its pedestal, when a suitable site shall have been determined upon. Admiral Sir Erasmus Ommanney presided, in the absence of General Sir James Alexander, and read a communication from that officer, detailing his initiatory efforts to secure the removal of the obelisk.

Mr. Dixon premised his lecture by observing that, as this was his first opportunity of speaking in public since the accomplishment of the first portion of his task, it was only meet that he should place on record a warm acknowledgment of the kindness and liberality of the Khedive, who had afforded them every facility for carrying on the work to a successful issue, and also of the assistance so readily rendered, first by the Hon. Mr. Vivian, our consul general in Egypt, and then by Signor Demetrio, the owner of the land occupied by the prostrate obelisk. Cleopatra's Needle, as it has been termed, was the oldest monument existing which recorded upon its face a history dating from its birth, and as some persons had questioned the utility of taking such pains to possess it, he might, he thought, bring to their recollection a few of the principal dates with which the monolith was associated. Fifteen hundred and fifteen years before Christ, Thothmes III, the greatest monarch of his time, caused this stone to be quarried at Syene, some seven hundred miles up the Nile, and erected in the City of On, in celebration of a high festival, and engraved upon it hieroglyphics commemorating the event. Three hundred years later Rameses II., finding no more honorable place in which to inscribe a record of his achievements and virtues, added other lines of characters. Twelve centuries passed, and On meanwhile became the great university of the world. Joseph, and after him Moses, went there to learn and study all the wisdom and science of the ancient Egyptians; and after them Euclid, Pythagoras, Plato, and other men illustrious in the annals of ancient history. This brought the period down to the Christian era and the time of Cleopatra, with whose history the name of the obelisk was so intimately associated, and who, no doubt, instigated its removal to the Alexandria site, although she was not fated to witness its erection there. For the further history of the obelisk, we were indebted to an inscription discovered on a claw of one of the brass crabs that formerly supported the stone on its pedestal. It related that, during the seventh year of the reign of the Emperor Augustus, Barbarus, the then Prefect of Egypt, caused the monument to be erected by a certain Pontius—supposed by some to have been the grandfather of Pontius Pilate—to ornament the water-gate of Cæsar's temple. How the obelisk came to be thrown down was uncertain, but possibly it might have been for the sake of abstracting the said brass crabs. The obelisk suffered no further vicissitudes until the year 1801, when the French endeavored, during their occupation of Egypt, to remove the mass to Paris, but were prevented from carrying out that intention by their defeat at the hands of the British troops. Mr. Dixon then glanced at his own connection with the present effort to realize Mehemet Ali's gift to the nation, and said that some years ago, in conjunction with General Sir James Alexander, whom he had found working in the same field, a plan of transport had been matured, and the preliminaries arranged, and there only remained the sinews of war to be provided. It was at this juncture that Mr. Erasmus Wilson came forward, and if the obelisk was destined to be erected in London, it was to that gentleman that the thanks of the nation would be primarily due.

Fig. 1.—STEAM SIPHON PUMP.

Such being the history of the monument, he thought no one could say that the efforts to preserve it from destruction had been misdirected. Passing to the more scientific part of the subject, namely, the engineering appliances adopted in connection with the transport and erection of obelisks, Mr. Dixon said that the Egyptians left no decisive record of their plan; but in the erection of the St. Peter's obelisk before the Vatican, the Romans employed for a month the united power of fifteen hundred men and one hundred and forty horses. The French method in 1835 was not materially different, although they economised labor better, both consisting in building up a timber framework round the obelisk, and hauling it into an upright position. But with the advent of newer and better mechanical appliances, he thought it would not be to the credit of English engineering if he followed a similar plan in the present case. Mr. Dixon then went on to describe the construction of the vessel built to encase the Cleopatra Needle and the calculations involved, and the incidents of the launch, which have been already made public. He argued that the voyage of the vessel had fully borne out the conclusion formed as to her perfect seaworthiness, and that they were running no risk whatever in trusting the obelisk in such a structure. But for the unfortunate shifting of the ballast in the Bay of Biscay all would have ended well, for the ship remained perfectly sound and water-tight. She was now at Ferrol, in Spain, but they might reasonably hope before long to witness the arrival of the Needle in the Thames.

Hay Fever.

In an article on hay fever published in the *Medical and Surgical Reporter*, Mr. J. E. Bell says that he suffered extremely from the disease, and consequently determined to clearly ascertain its cause. He says:

"I knew it was to be found in something that made its appearance coincidently with the disease, and passed away coincidently with its decline. Noticing that my suffering and the flowering of the common hay weed (*Ambrosia artemisiæfolia*) came hand in hand together—and that when its flowering was over, and the pollen ceased drifting from its numerous little flowers, my trouble also abated, I concluded that the cause was to be found in the flowers of this weed; and repeated experiments and subsequent experience have convinced me that its pollen is the prime, if not the sole, factor in the causation."

This weed is one of the most abundant that infests our cultivated fields. It springs up after the harvesting of our wheat, oats, etc., and becomes as thick as the wheat itself had been, and grows along fence rows, roadsides, and everywhere it can escape the hoe and plow, by thousands. Its flowers, beginning to open about the first of September, are in long terminal racemes, and its barren ones are as numerous, and afford a sulphur-like pollen in the most wonderful profusion. This pollen, being very light and fine, is easily wafted about by the wind, and is floating everywhere in the atmosphere in myriad numbers during the whole period of the plant's flowering.

Mr. Bell considers its effect upon the mucuous membrane to be caused by a volatile oil which it carries. He thinks that a saturated tincture of the open flowers of the weed, if taken for a month before the regular appearance of the disease, will do much to brace the system against the effects of the poison. Months after the trouble was over he applied this tincture to the mucuous membranes, with the effect every time of inducing a slight attack.

The chief manifestation of the disease is an intolerable itching. To alleviate this, a gentle stimulant is useful. Cold water, warm water, a solution of common salt, a weak alkaline solution, or mild soapsuds will often prove grateful applications to the conjunctiva. The sufferers must not rub the afflicted parts, and should sneeze and cough as little as possible, as these only aggravate the trouble without relieving it. In advanced stages, coughing is of course sometimes necessary. The remedy Mr. Bell recommends, to allay the itching and quiet the cough, is the oil of peppermint. It acts as a local anæsthetic and gentle stimulant. All the instrument required is a wide-mouth vial, partly filled with the oil. By partially covering the mouth of the vial with his lips, and making inspiration, the patient can cause the air to pass over the surface of the oil and arise to his lungs charged with its vapor, the pharynx getting its benefits at the same time. By applying the nostrils to the vial in a similar manner, the Schneiderian may be impressed likewise, and when it is desirable to apply the vapor to the conjunctiva, it is readily accomplished by blowing downward into the vial, and directing the rebounding or upward current of air to the eyes. Whenever the vapor of this oil, or the oil itself, is applied, a feeling of cooling warmth succeeds, soon followed by a soothing sensation of relief.

Strychnine will sometimes prove quite valuable in hay fever, by in some way bracing the system against the effects of the poison; but to get its full benefit it should be resorted to some time before the expected attack.

New Agricultural Inventions.

A Hen House patented by A. H. Kling, of Perrysburg, Ind., is divided into two compartments by a partition in line with the middle part of the platform upon which the nest boxes stand. The lower board of the partition is hinged at its upper edge to form a swinging door. One division of the house is larger than the other, and in this are the roosts and nests for laying. When a hen wishes to set, the swinging door is raised and her nest pushed under into the other partition and the door dropped. The setting hens are thus kept separate from the rest and free from any annoyance.

A Corn Planter has been improved upon by Allen F. Hall, of Onarga, Ill., so that the wheels are provided with semicircular distance-measuring cams, combined with and constructed to hold dropping slide levers which are pivoted to the middle crossbar of the frame. It drops the corn automatically, at uniform distances apart, and marks the hills so that the field may be planted in accurate check row.

J. M. Bassett, of Athens, Ga., has invented a Plow, so constructed that the standard can be easily adjusted to give any pitch desired. The branches of the standard in which the plow beam rests are secured to the beam by a clamp formed of a bow and a bolted yoke. By loosening the clamp the standard can be easily moved. It will prove a very acceptable instrument to farmers.

A novel Wheel Cultivator, devised by Messrs. Irwin Macy

and John C. Watkins, of Harrisburg, Oregon, embodies a number of ingenious mechanical contrivances whereby it is more easily controlled and readily adjusted to work at any desired depth in the ground.

Mr. P. McCollum, of Fayette, Mo., has devised a new and ingenious Corn Planter, which is of simple construction and is so contrived as not to clog in wet ground, and to scatter the seeds as it plants them.

W. H. Carpenter, of St. Joseph, Mo., has patented a Gate Hinge, which consists in a rectangular reversible latch pivoted to the gate and constructed so that it is self-latching, and will not be affected by the sagging of the gate. It is valuable to farmers.

Samuel Myers, of Adamsborough, Sharpsville, Ind., has invented an improvement on his Fruit Drier which he patented in April 24, 1877. The supply of heat to the fruit trays is regulated at will, and each tray is independent of each other in the drying process. The improvement consists of the connection with the trays of diagonal partitions and pivoted valves, that open or close the space between the shelves and partitions, for admitting or excluding the heat from the rays.

A Platform Gear for Wagons, invented by B. F. Rix, of Mason, Mich., is made of a solid centerpiece, or of two pieces bolted together, and bent forward and back to the spring block. It is very light, and there is no possibility of its breaking or sagging down and causing the fifth wheel to bind.

In a Combination Hoe patented by D. A. Nelson, of Tyler, Texas, the blade fits into a nib in the hoe head and is secured by a staple and key. A ring binds the parts securely together. Hoe blades of every description may be adapted to this head.

William M. Leaman, of Bullitt's Bayou, La., has invented a Bale Tie which consists of a U-shaped buckle, corrugated lengthwise on the inside, and a metallic strap, the ends of which are corrugated crosswise, for the purpose of being held from slipping when placed to overlap each other.

A Self-Acting Wagon Brake has been patented by Alfred Hart, of San Marcos, Texas. The wagon body is hung so that it is free to receive endwise movement on its front bolster. By rods and cranks this works a brake, which, by the forward movement of the body, is brought against the wheels. The steeper the grade, the more forcible will the brake be applied. A suitable device controls the brake, if so desired.

A Grubber and Stump Extractor, invented by John Motheral, of North McGregor, Iowa, consists of a standard so mounted as to be moved about its vertical axis. A chain and pulley are attached to the stirrup, and is wound up by a large spur wheel, which is itself moved by a hand crank on a pinion shaft. It is a ready means of applying power.

Mr. Julius Hartmann, of Louisville, Ky., has patented a new Plow. Its point is curved to give a centre draft, and the mouldboard and point together constitute a wearing surface having a gradually increasing convexity and width back of the center, and a gradually increasing concavity and width forward of the center, up to the beveled portion of the point. This shape is calculated to produce the best results in practice. as respects friction and draft, and turning the furrow. The landside is formed of a bar which is beveled on each side from the bottom upward. The standard is provided with lugs or shoulders, which engage or lock with the upper edge of the mouldboard, and thus relieve its pivots of part of the strain incident to plowing.

Gigantic American Reptiles.

Professor O. C. Marsh in the last number of the *American Journal of Science* states that the museum of Yale College has recently received the greater portion of the skeleton of a huge reptile, which proves to be one of the most remarkable animals yet discovered. It was found on the eastern flank of the Rocky Mountains, in beds which are regarded as corresponding nearly to the Wealden of Europe, and which may be classed as upper Jurassic. The remains are well preserved, but are embedded in so hard a matrix that considerable time and labor will be required to prepare them for a full description. The characters already determined point to affinities with the Dinosaurs, Plesiosaurs, and more remotely with the Chelonians, and indicate a new order, which may be termed *Stegosauria*, from the typical genus here described.

In this specimen, some of the teeth preserved have compressed crowns, and are inserted in sockets. Others are cylindrical, and were placed in rows, either in thin plates of imperfect bone or in cartilage. The latter are especially numerous, and may possibly prove to be dermal spines, having all the essential characters of teeth, as in some fishes. The vertebræ are biconcave, their neural arches being coosified with the centra, and the chevrons articulated. The limb bones indicate an aquatic life. The body was long, and protected by large bony dermal plates, somewhat like those of *Atlantochelys* (*Protostega*). These plates appear to have been in part supported by the elongated neural spines of the vertebræ. One of the large dermal plates was over three feet (one meter) in length.

The present species was probably thirty feet long, and moved mainly by swimming. For its discovery science is indebted to Professor A. Lakes and Engineer H. C. Beckwith of the United States Navy, who found the first remains in Colorado near the locality of the gigantic *Atlantosaurus montanus*, and in essentially the same horizon.

NEW DINOSAURIAN REPTILES.

The gigantic Dinosaur, *Atlantosaurus montanus*, proves to belong to a lower horizon than at first supposed, and is really from the upper Jurassic. Additional remains on the type specimen, moreover, throw considerable light on the structure of this largest of land animals, and indicate that it is the representative of a distinct family, which may be called *Atlantosaurida*. The size of the original specimen of *A. montanus* may be estimated from the femur, which was about seven feet in length. If the animal had the proportions of a crocodile, it was at least eighty feet long.

Another gigantic Dinosaur, allied to the above, and of scarcely less interest, is represented in the Yale Museum by a nearly complete skeleton in excellent preservation. It is from the Jurassic beds in the Eastern foot hills of the Rocky Mountains, but from a somewhat lower horizon than the type of *Atlantosaurus*.

The cervical vertebræ are strongly opisthocœlous, and are rendered comparatively light by large pneumatic cavities in the centra. The anterior dorsals have similar characters. The posterior lumbars have the articular faces very nearly flat, and transverse. The sacral vertebræ are more solid, and have their transverse processes nearer the middle of the centra than in *Atlantosaurus*. The anterior caudals are biconcave, and their interior structure is cancellous. The chevron bones differ from those of most known Dinosaurs in having the superior articular ends of the rami not united, but separated from each other, as in the Mosasauria with free hæmapophyses.

This animal must have been between fifty and sixty feet in length, and more than thirty in height when erect.

Another huge Dinosaur, apparently of the same genus, but of smaller size, is represented in the Yale Museum by the more important parts of a skeleton, in remarkable preservation. In this specimen the cervical vertebræ have the walls of the centra very thin. The caudals preserved are elongated and slender, indicating a long tail. The femur is comparatively short, and without a third trochanter. The great trochanter is much lower than the head of the femur, and continuous with it. The metapodial bones indicate a foot of medium length.

The known remains of this species are from the same geological horizon as those above described. They indicate an animal at least thirty feet in length.

New Mechanical Inventions.

In a Universal Joint patented by Phineas Burgess, of Brooklyn, New York, the flattened ends of the shaft have the inner lugs formed upon them, at such a distance from the outer or ordinary lugs as to rest against the inner side of the coupling ring, interposed between them and the outer lugs, and receive and support the inner ends of the coupling bolts.

A Brick Machine has been patented by W. J. Blair, of Oil City, Pa. The prepared clay is introduced from the mill through an orifice in the box, whence it is pressed down through orifices into a mould by a follower worked by a lever. A V-rod fitted with wire passes along the top of the mould and separates the clay in the mound from the clay in the guide spouts, so that when the loose bottom of the box is lowered the filled mould may be easily drawn out and replaced with an empty mould.

James White, of North Adams, Mass., has invented an improvement in spindles and their bearings. The spindle is provided below the upper shoulder with a second shoulder, between which and the collar of the upper bearing a small annular air chamber is formed, which surrounds the upper chamber. The oil is introduced through holes in the upper bearing, and any waste oil is caught by a cup-shaped support at the bottom.

Hermann Springborn and C. H. Bauch, of Holyoke, Mass., have invented an improvement on their cloth-finishing machines patented July 17, 1877. It consists in constructing the concave bed with a detachable unoxidable jacket, and in a locking device for the weight-adjusting levers. The bed with brass jacket is much cheaper than one made wholly of brass.

A Blind-Slat Planer, patented by R. S. Griffin, of Worcester, Mass., consists in combining with a suitable bed and laterally adjustable guides, suitably mounted, a rectilinear reciprocating plane, the cutters of which are so arranged that they will dress one side and one edge of a slat. A novel device keeps the slat down firmly on the bed, and discharges the dressed slat from the machine.

In a rag-washing machine for paper making, patented by F. A. Cloudman, of Cumberland Mills, Me., a cylinder is arranged at the inside with a number of curved buckets extending from the circumference to a central outlet and flanged at the edges. The volume of water is lifted to a lesser height, by reason of the peculiar form of the buckets and their inclination toward the outlet. The buckets are best made of a continuous piece of wood and are surrounded with wire cloth to retain the rags.

R. S. B. Thornton, of Pawtucket, has patented an improvement to be applied to the Noble Wool Combing Machine. A shaft drives a flanged pulley keyed on it, which communicates motion by an endless belt to two other flanged pulleys. They are fitted on longitudinally slotted pieces and brackets secured by thumbscrews.

An improved Traction Wheel has been patented by W. H. Trenwith, P.O. Box 4,068, New York city. It consists of a movable web or center section, supported on rollers or wheels arranged within a revolving traction wheel of larger diameter, the web supporting an axle made of two symmetrical sections, to one section of which suitable operating mechanism is applied. It furnishes a simple means for starting the vehicle and stopping the same, without the use of brakes.

Photo-Printing Plates.

There are two methods of producing the type plate from the negative, namely: the swelled gelatin and the dissolved gelatin processes. In the latter process, a thick film of bichromatized gelatin is spread on a sheet of glass, and upon this a sun picture of the negative is made, as in ordinary photographic printing. Wherever the light strikes, which in this case is upon the writing, the gelatin becomes insoluble. The gelatin film is then moistened with cold water, which causes the soluble portions between the lines to swell up and leave the writing sunken. A plaster cast is taken from this, when the writing will appear in a raised line upon the plaster. This cast is then pressed into wax; the wax impression is dusted over with plumbago to give it a metallic conducting surface, and is then placed in a galvanic bath, remaining there from one to three hours, producing an electrotype plate from which the printing is done. It is found, however, that the lines on the plaster cast are not high enough to make a good type, and before pressing the cast into the wax, the spaces between the lines are routed out, or dug out, with a tool, to any required depth. Another method of accomplishing the same result is first to take the wax impression, the workman afterward building up the spaces on the wax, before putting it into the galvanic bath. Still another way is to take a plaster cast from the one already made, which will reverse it, the lines appearing sunken, and from this last cast to make a stereotype plate in type metal, and rout out the spaces in the plate itself from which the printing is done.

The dissolved gelatin or photo-electrotype process is somewhat more simple, and is the reverse of the one just described. The film of gelatin is made very much thicker than before. A light sun picture is taken, leaving sharp outlines. The surface is moistened and the gelatin washed out, slightly deepening the spaces between the lines. The film or plate of gelatin is then dried, and these depressions are filled with an opaque paste, and the plate is again exposed to the full glare of the sun, by which the chemical effect of the light upon the lines is intensified and deepened, so that the gelatin is hardened to a considerable depth and a gradually increasing breadth, making a firm foundation for the type. The plate is again washed and the spaces deepened to any extent desired. It is then dried, and can be printed from directly, as a type plate, or electrotyped as before described.

The negative can also be used in connection with the zinc etching process, by which the writing is transferred to a zinc plate, and the spaces between the lines eaten out by acids.—*Franklin Journal.*

NEW BOOKS AND PUBLICATIONS.

A MANUAL OF THE MECHANICS OF ENGINEERING AND OF THE CONSTRUCTION OF MACHINES. By Dr. Julius Weisbach. Vol. II. Translated from the Fourth German edition, by Professor A. Jay DuBois, Ph.D., Published by John Wiley & Sons, 15 Astor Place, N. Y. Price $6.00

Dr. Weisbach's great work has for years been known as the best standard authority on its subject. The progress of discovery and invention has, however, necessitated its revision and adaptation to modern ideas, so that in the portions relating to practical applications of mechanics the changes have been extensive and far-reaching. The complete work consists of three volumes. The last American translation of the first volume was made by Mr. Sekley B. Coxe in 1870, and it was the intention of the translator to complete the whole work. Being unable to carry out this plan, Mr. Coxe withdrew in favor of Professor DuBois who has carried on the labor through the present volume of 1,150 pages in a manner which cannot be too highly commended. Although this volume is one of a trio, it is nevertheless rendered complete in itself by the insertion of an introduction covering those portions of volume I, which are most commonly referred to in the text. It treats more especially of the application of the general principles of mechanics, and is divided into two sections. The first treating of the application of the principles to structures of stability has been judiciously omitted as its matter is obtainable in many other English works. This book forms portion of the second section, namely: I, which discusses the various motive powers and their recipient machines, hydraulic and air motors. Part II, relating to heat, steam, and the steam engine will constitute another volume. The work is one which inventors and engineers should study carefully and closely. As here produced it is in admirable form. The illustrations are new, copious, and fine, and the typography admirable Professor DuBois has hitherto done some capital work in the ay of translating foreign technical treatises, but none better than this. The edition, we may add, has been specially authorized by Dr. Weisbach, son of the late author.

THE SILVER COUNTRY OR THE GREAT SOUTHWEST. By Alexander B. Anderson. Published by G. P. Putnam's Sons, 182 Fifth avenue, New York city. Price $1.75.

This is a book on the mineral wealth of the former kingdom of New Spain, comprising Mexico and the Mexican cessions to the United States in 1848 and 1853. It describes the resources of the country and shows that the Southwest is producing each year two thirds of the silver of the whole world. The work is well illustrated by maps, and in view of the present agitation of the silver question will be read with timely interest.

FORMULÆ FOR THE CALCULATION OF RAILROAD EXCAVATION AND EMBANKMENT. By John Woodbridge Davis, C.E. Illustrated.

This is a second edition of a work that has already met with much favor. It has been adopted as a text book in the School of Mines of Columbia College and many other institutions of the kind. It has been revised and improved so as to be still more valuable to engineers.

BEAUTIFUL HOMES, OR HINTS IN HOUSE FURNISHING. By Henry T. Williams and Mrs. C. S. Jones. Henry T. Williams, Publisher, New York. Illustrated. Price $1.50.

Household taste is but a synonym for household culture. This work is designed to cultivate this taste by narrating and illustrating everything relating to the picturesque furnishing of bedrooms, halls, parlors, and sitting rooms, so that any lady may by following its directions make a winning and beautiful home. The contents relate specially to house furnishing and furniture, and are profusely illustrated.

"Fret Sawing," Household Hints," and "Needlework and Embroidery," are other works issued by the same publisher in the same style. at fifty cents each. The ladies will find them of much value in the household.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion.

Notes & Queries

(1) N. K. L. asks for a recipe for removing dandruff? A. Sesquicarbonate of ammonia, 1 oz.; spirit of rosemary, ½ pint; rose of elderflower water, 1½ pint.

(2) In answer to C. E. H., who asks us as to the cure for epilepsy, and to several others who ask medical advice, we beg to state that such information is outside our field, and that the only counsel we ever give relating thereto is for the writer to consult a competent physician.

(3) R. E. C. asks for a recipe for making japans? A For black japan grounds mix shellac varnish with either ivory black or lampblack; but the former is preferable. These may be always laid on with the shellac varnish and have their upper or polishing coats of common seed lac varnish. A common black japan may be made by painting a piece of work with drying oil and heating it in a stove that is hot enough to change the oil black without burning it.

(4) In answer to C. E. B., who inquires whether diphtheria originates in infection? A. You will find that exhaustive researches have been made on this subject—the connection of diphtheria with certain vegetable organisms. See Tremssen's "Cyclopedia of Medicine," vol, 1, pp. 569—699.

(5) J. H. says: As light and heat are not the same, through what medium do they travel from the sun? A. Light and radiant heat are physically identical. They differ chiefly in the distinct physiological sensations they produce on us, and therefore vary not more, perhaps even less, than violet light does from red. The medium of the vibrations of light is a supposed imponderable ether which fills interstellar space.

(6) A. H. S. asks for a recipe for making ink rollers that will not dry or harden? A. Summer use, 1¼ lbs. best glue and 4 lbs. molasses; winter use, 1 lb. best glue and same amount of molasses. Soak the glue 1½ hours if thick, or 1 hour if thin. Lay it on a board until next day, then melt down. Have as little water in the glue as possible. Add the molasses, let boil once, and keep just under the boiling point for two hours. Pour into well cleaned and greased moulds. The above quantities are sufficient for an 18 inch roller; other sizes in proportion.

(7) J. C. S. says: My printing press passed through a large fire and has become very rusty. What can I use to remove it? A. Use an emery block. 2. What kind of paint shall I use after having removed the rust? A. Ordinary lead colored paint.

(8) E. B. is informed that his idea of a rubber check valve in a hydraulic ram is not new, but on the contrary is already patented.

(9) W. W. asks for a good cheap imitation of silver? A. Tin 3 ozs., copper 4 lbs.

(10) O. J. M. asks: 1. What is the best way to soften steel, or old files, for small work? A. Heat to a red and cool in slaked lime. 2. Will it hurt an emery wheel to use water on it while grinding? A, Some emery wheels can be used with water, and some cannot.

(11) H. C. B. asks (1) how to clean files when they are filled with hard wood? A. Use a piece of thin copper across the file and in the rows of the teeth. 2. How to clean paint from tin boxes? A. Use benzine to wash them out.

(12) H. W. asks for the proper length of a connecting rod compared with the stroke of engine? A. Not less than three times the length of pistoh stroke.

(13) L. says: Can you give me the dimensions of a catamaran, say 20 feet long? Please state full particulars. A. See working drawings and full particulars for construction of Catamarans in SCIENTIFIC AMERICAN SUPPLEMENT Nos. 105 and 106. To be had at this office and of newsdealers generally. Price 10 cents each.

(14) E. W. asks: How is impression paper made that is used to transfer designs on to black walnut? A. Rub smooth writing paper with a mixture of lard and black lead. Leave it to dry and next day wipe off any excess with a rag.

(15) M. R. asks what the composition is that strikes fire at the end of cartridges? A. It is the fulminate of mercury, made by treating mercury with nitric acid, and then with alcohol.

(16) W. T. S. asks for a recipe for starching and ironing fine shirts and collars? A. Rinse the articles in three waters, dry them and dip them into thick made starch which has previously been strained through a piece of muslin. Squeeze them, shake them gently, and again hang them up to dry. When they are dry, dip them twice or three times into clear water, squeeze them, spread them on a linen cloth, roll them up in it, and let them lie an hour before ironing them. If gloss is desired put a piece of paraffin about as big as a hazel nut in the starch.

Is there any known process by which the beetle can be prevented from depositing their eggs in peas? A. We know of none. Address Agricultural Bureau at Washington.

Is there any known process by which iron or steel can be welded to copper? A. You may braze copper or iron or steel by the spelter brazing process.

(17) G. M. K. asks for a recipe for making a boot polish blacking? A. India rubber in small pieces, 18 ozs.; hot rape oil, 1 gallon; dissolve. Add ivory black, powdered, 60 lbs., molasses 45 lbs. Mix, add 1 lb. gum arabic dissolved in 5 quarts of vinegar. Grind to a smooth paste in a color mill and add oil of vitriol 12 lbs. Stir daily for a week and put up in cans or pots.

(18) A. P. W. asks how to true an emery wheel? A. Some emery wheels will turn with a red hot iron, others may be wet and trued with a turning tool or old file.

What can be used to prevent a gun barrel from rusting? A. Pure lard oil. Other questions repeatedly answered in back numbers.

(19) W. J. N. asks for the best way to clean shoe polishing brushes? A. Try washing in vinegar.

(20) N. T. P. asks how rifle and shot gun barrels are polished so highly on the inside? Also how the grooves or furrows are cut out so smoothly in rifle barrels? A. The bores are polished in the boring by the reamer. The grooves are cut by a rifling machine.

(21) C. S. asks: What good and cheap antiseptic can I use to preserve specimen fruits with (by putting them in jars and bottles) so that the quality of same will allow of their being used for cooking, etc.? A. You may try a solution of salicylic acid in water—15 or 20 grains to the gallon, The solution is perfectly transparent, and fruit immersed in it will preserve its natural appearance for a very long time. The taste of fruit thus treated is not materially altered nor its wholesomeness affected.

(22) C. R. J. asks what he can use to scent bait with to draw rats to a trap? A. Old cheese or oil of aniseed are considered among the best.

(23) B. F. asks whether the bite of a dog that is not mad will produce hydrophobia? A. This is an open question, authorities not agreeing. It is always best to take every precaution, and especially thoroughly to cauterize the wound.

(24) W. E. M. asks: 1. What is it that makes a meerschaum pipe color? A. Its permeation with the dark oily matter from the tobacco. 2. What will make it color fast? A. Boiling in wax. 3. What will cement amber? A. Finest pale orange shellac (broken small) 4 ozs.; strong rectified spirit, 3 ozs. Digest in a corked bottle in a warm place until dissolved.

(25) P. V. D. asks how to cover boots with India rubber, so as to make them waterproof? A. Melt, at a gentle heat in a porcelain vessel, 3 ozs. of spermaceti, and dissolve in this 6 drachms of gum rubber (caoutchouc) cut into shreds. Then add 8 ozs. of seriatim of tallow, 2 ozs. of lard, 4 ozs. of amber varnish and a small quantity of ivory black. Give the leather several coats, and polish with a blacking brush. Solutions of rubber, excepting that in melted naphtha-line, do not work very well alone on leather.

(26) C. E. H. asks: What are the best ingredients to use in connection with plumbago for stove polish? A. Solution of pure asphaltum and powdered black pyroxene or cupric oxide.

(27) Old Reader asks if there is any way of bending black walnut? A. Steam or soak the timber and let it dry while bent to the required shape.

(28) J. S. asks for the following recipes: 1 To dye black? A. Allow 1 lb. of logwood to each lb. of goods to be dyed. Soak it over night in soft water, then boil 1 hour and strain the water in which it is boiled. For each lb. of logwood dissolve 1 oz. of blue vitriol in lukewarm water sufficient to set the goods. Dip the fabric in, and when saturated with the vitriol solution turn the cloth into the logwood dye. If cotton, boil 10 or 15 minutes; if silk or woolen, keep at scalding heat only for 20 minutes. Drain without wringing, dry in air, and set the color by immersion in salt and water. One teacupful of salt to 3 gallons of water. 2. To dye dark blue? A. Give the goods a mordant of tartar, lift, add a little chromate of potash; again work for 15 or 20 minutes and rinse; next boil in a bath of logwood, adding toward the last a few grains more of chromate, again boil and finish. The whole quantity of chromate used should not exceed ¼ oz. to each lb. of logwood taken for the bath. Very dark. 3. To bring out grain to the surface of walnut? A. Oil it. 4. To polish black bronze? A. Clean and polish the surface. Apply jeweler's rouge made into a smooth paste with water. When dry place the object on a common fire shovel and expose it over a clear fire for about one minute. Lastly, when cold, polish with a plate brush. 5. To extract grease from leather without injuring the same? A. Ammonia 2 ozs., soft water 1 quart, saltpeter 1 teaspoonful, shaving soap 1 oz. Mix and apply. 6. What composition is used in making printing inks? A. The varnish is composed of linseed oil 20 gallons boiled in an iron pot. Soon after the smoke begins to rise, this is ignited and allowed to burn until a sample may be drawn into strings ⅛ inch long between the fingers. The flame is extinguished and 1 lb. of black resin added and dissolved, and then 1¾ lbs. dry brown soap. When all is combined, the varnish after a good stirring is set aside. Mix together indigo and Prussian blue of each 2½ ozs.; mineral lampblack 4 lbs., vegetable lampblack 3½ lbs., and stir them gradually into the varnish. The mixture is then thoroughly ground in a mill.

(29) In answer to W. C. F., who refers to our answer to query No. 17, December 15, 1877. The receipt refers to articles of brass or copper, which must be perfectly cleansed from grease before stuffing. You will find a number of the best recipes for silvering on p. 377, current volume.

(30) J. L. asks: Does the altitude of a place have any effect on the running of watches adjusted and regulated near the sea level? A. If the watches are properly adjusted and regulated, it should not.

Are standard aneroid barometers as reliable for general use as mercurial? A. Yes.

(31) T. P. C. writes: Can you inform me how the frosted engraving is produced on cutlery, swords, etc.? A. By etching the polished surface with acid. The articles are first heated to about 212°; then a thin coat of beeswax is melted over their surface, and when this cools the design is scratched through the wax by a needle; the acid is then poured on the design, and may be prevented from falling off by a little wall of wax built around the design. Muriatic acid answers very well for etching. The time required for the operation is best found by a little practice, as the fine lines of the design take more time to etch than is required for the coarse ones. When it is decided that the etching is complete, with clean cold water thoroughly wash away all traces of acid, and then with a little benzine remove the wax, and polish with clean, dry, chamois leather.

(32) T. N. asks: 1. Can beeswax work its way through the packing around the piston rod of the engine and into the cylinder, and more or less lubricate it? A. In ordinary cases it can. 2. Is it the friction on the piston rod that makes that groaning noise when starting up the engine and in motion, or is it the steam packing in the cylinder that does it? A. When it occurs it is generally due to the piston.

(33) A. H. D. asks: Would be glad to learn through you of a good practical textbook on calculations of hydraulics in general, but especially how to ascertain the number of horse powers used by a manufactory where the water is drawn from a canal, pond, or other reservoir. Also to calculate the hydraulic capacity of canals, rivers, streams, etc.? A. Box's work on "Hydraulics," which can be procured from a dealer in scientific books, contains a good summary of the most important rules. You will also find much useful information on the subject in Trautwein's "Engineer's Pocket Book." There are many other valuable works, a list of which can be found in the catalogues of the booksellers who advertise in our columns.

(34) C. O'B. asks for a cheap lacquer to bronze cast iron? A. Make a strong solution of copper chloride in hot water slightly acidified with muriatic acid, and apply this hot to the iron; then wash, dry with sawdust, and apply a lacquer made as follows: 1 gallon alcohol (spirits), 5 ozs. of shellac, 4 ozs. of gum sandarac, 1 oz. of gum elemi; heat gently in a tin vessel for some time, strain off, and add 6 ozs. of turmeric and 1 of gamboge.

(35) J. L. M. asks: What is the cause of that peculiar whiteness of the brick fronts of our buildings, more particularly those facing the north and east? A. We have not chemically analyzed the efflorescence referred to, but understand that it is attributed to the action of the elements upon the brick, whereby there is deposited a salt upon the surface thereof, mostly precipitated from the atmosphere, but at the same time extracting a portion of its ingredients from the mortar with which the brick is laid. On surfaces exposed to the sun's rays the deposit is prevented by evaporation.

(36) T. A. writes: I have a six horse engine, but I cannot make it keep up steam. Sometimes the fire goes out suddenly. I have to draw the dead coals and rekindle my fire. I attribute this to the fact of the exhaust pipe being carried into the smokestack. Am I right? A. Examine the inside of your boiler, and if you find it covered with scale, do not try to keep up steam until you remove it. Then if your boiler is exposed to the cold, cover it with a blanket padded with hair. Now if you do not have sufficient steam with a good fire, the cause is very likely to be that your boiler is too small for the engine.

(37) F. D. H. asks for a furniture polish? A. Take boiled linseed oil 1 pint, yellow wax 4 ozs. Melt together and color with alkanet root to give a reddish tinge. (2) A good and simple furniture polish consists of a little Castile soap scraped into a pint of warm water. Add three tablespoonfuls of sweet oil; heat and apply while hot.

(38) W. H. L. asks: Is it safe to wall in a large boiler in such a way that the fire can go entirely around it? We have put up a steam grist mill, and the parties who set the boiler, instead of shutting off the fire at the water line, arched the brickwork over the boiler, leaving a space of four or five inches for the heat and flames to pass over and around the boiler, giving as a reason that in this way it would consume less wood and would furnish dry steam for engine, and was in all respects better. A. In our opinion the parties show good judgment. In addition to the saving of fuel, it appears to us that the boiler is more likely to expand evenly, and be less subject to those severe strains caused by unequal expansion of the metal.

(39) F. J. C. asks for a flavor by which common tobacco can be given the Havana flavor? A. Extracts of vanilla and tonquin are used for this purpose, we believe.

(40) W. W. asks: What is the cheapest substance I can use for cementing together readily layers of straw board, the same to be waterproof or nearly so? A. You can use a solution of shellac in alcohol for this purpose, or a hot solution of glue in water, in which is dissolved 1 oz. of bichromate of potash and 2 ozs. of gelatin· this cement must be exposed to sunlight in order to render it partially insoluble.

(41) J. H. H. asks how he can become an engineer on an ocean steamer? A. You must search for a position as engineer's assistant, or even as stoker, on some vessel; prove yourself to be steady and reliable, and if you are strong and healthy, and have good mechanical ability, so as to be able to make repairs under difficulties, you will be able to pass the required legal examination for a third, then a second, and if you are fortunate, a first rate, or chief engineer.

(42) C. W. D. asks how to transfer pictures on paper to glass? A. Use good starch paste fastening the printed side next the glass; when dry use castor oil as directed on pp. 226 and 392, vol. 27, SCIENTIFIC AMERICAN.

(43) J. N. asks how to make the American commercial potash, and where is it made? A. Wood ash, preferably that of green wood and oak leaves, is digested in water and the solution obtained evaporated in iron pots and calcined at red heat to free from carbonaceous matters. The greater part of American potash by this method is produced in Canada. The Stassfurt salt mines, the residue from the manufacture of beet sugar, and the suint of wool now supply the major portion os commercial potash.

(44) T. E. M. says: A friend of mine has a tree in front of his house, one limb of which points toward the west. In the winter, when very cold, the limb turns about 7 inches towards the south. With warm weather again it resumes its former position. What is the cause of it? A. The cause of this phenomenon may be found in the power of frost to expand water in congealing it. If you stand upon the roof of a house in a thickly populated city and observe the chimneys of the houses, you will find that almost without exception they lean towards the south and east. An explanation of this may be given in this way: The water absorbed by the mortar in the joints of the brickwork is frozen in the night, and during the day on the north side remains frozen; but on the south and east sides it is thawed out. The result is evident: one side is elevated and the other depressed, thus warping the chimney over towards the lower side. In the same way the frost acting upon the water in the pores of the wood may bring about a similar result in the tree you refer to.

(45) R. R. J. asks: What is the best solvent for India rubber when designed for marine glue, and is the crude or pure rubber best? A. Pure naphtha. Use ordinary caoutchouc or crude gum rubber.

An experienced painter tells me that bronze powders, if put on when the size is too green, will be drowned, and soon turn color. Is the same danger to be apprehended in the use of bronze powders on paper with printer's size? What grade of bronze powder is best for durable work? A. No; pure gold bronze should be employed.

(46) C. F. F. asks (1) how to keep cider sweet and (2) how to clean musty cider barrels? A. 1. Add to the cider about $\frac{1}{1000}$ part of sodium sulphide dissolved in a little water. 2. Use a strong solution of soda containing a little alum, and then wash with plenty of cold water.

(47) O. C. L. asks for an easy, safe, and economical recipe for testing steam boilers? A. Fill the boiler with water, load the safety valve to the desired point, and heat the water gradually.

Also for destroying lice on cattle without injury to the brute? A. Perhaps some of our readers will be so kind as to send notes of their experience.

(48) C. R. asks how to make good hard soap? A. See No. (19), p. 123, vol. 37.

How can I prepare good hair oil? A. Castor oil 6½ pints, alcohol 1½ pints, oil of citronella ½ oz., lavender ½ oz. Shake well before each application.

(49) S. M. B. asks: Is mica a conductor of heat? A. Yes, to some extent.

Please tell me how to keep my feet warm without fire? I wear heavy boots and two pairs of socks. A. From your account the only alternative would seem to consist in increasing the thickness of the covering.

Is air heated by compression? A. Yes.

What is the best method of operating locomotive turntables? A. A well constructed turntable can easily be turned by any man with a lever of moderate length.

What is the best means of preventing a vessel from sinking, the means to be set in operation after the vessel strikes? A. A cellular construction of hull and watertight bulkheads.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

J. E.—It is not a meteorite, but marcasite imbedded in quartz. The brown coloration on the exterior is due to the conversion of the sulphite of iron into ferric oxide.—G. D. R.—It is sulphide of iron in a gangue of slate.—W. D. M.—It is a weathered sedimentary rock consisting principally of aluminous silicate, lime, and iron oxide. It contains nothing of value.—J. N.—It is limonite—a hydrous iron sesquioxide.—J. T.—The rock contains magnetic and ferric sulphides, and a little nickel and copper.—J. H. P.—It is ferric sulphide—not valuable.—B. L.—It is principally rosin. No "diamond dust" could be found in it.—P. L.—It is crystallized carbonate of soda. The commercial article is worth 5 cents a pound—chemically pure, fifty cents a pound.—A. I. H.—It is aluminite in a clay matrix. The aluminate consists of alumina 29·8, sulphuric acid 23·2, water 47·0—parts in 100. It contains no pigment.—G. K. No. 1 is galenite—lead sulphite. No. 2 is calcopyrite (copper iron sulphide) and galenite in quartzose gangue. May contain also zinc. No. 3 is dolerite containing sulphides of iron and copper and argentiferous galena.—No. 4 contains copper, iron, and lead sulphides—and some silver. No. 5 bears similar to the preceding. No. 6 contains much iron, but is rich in argentiferous galena. The vein is probably valuable.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Mechanism of the Heavens. By G. D.

On the Law of the Pressure of Saturated Steam with Relation to Temperature. By E. V.

On the Steam Yacht Estelle.

HINTS TO CORRESPONDENTS.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Cofrespondents whose inquries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Inquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

WANTS AND BUSINESS INQUIRIES.

Almost any desired information, and that of a business nature especially, can be expeditiously obtained by advertising in the column of "Business and Personal," which is set apart for that purpose subject to the charge mentioned at its head.

We have received this week the following inquiries, particulars, etc., regarding which can probably be elicited from the writers by the insertion of a small advertisement in the column specified, by parties able to supply the wants:

Who makes electric machines for magic lanterns?

Who makes the machine for felling trees exhibited at the Centennial?

What kind of battery is used in mines to fire several blasts simultaneously?

Who sells toy rubber balloons?

OFFICIAL.

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

November 27, 1877,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

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Pantographic engraving machine, W. S. Wight	197,507
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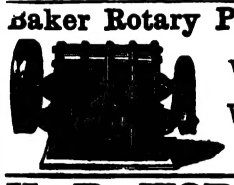

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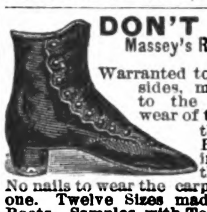

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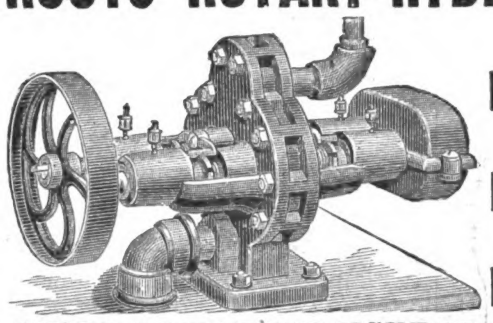

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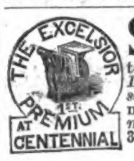

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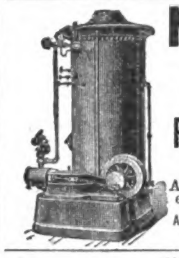

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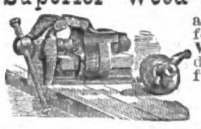

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